

Shortwave and Scanning Frequencies, How-To's, and Radio Reviews



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Cover Story**Late news item:
BNN Accused of
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See page 62

Reviews:

Is the Lowe SRX100 an HF-150 for half the price? Afraid not, says Magne, but it still has some excellent features going for it. See page 92 for the bottom line. Parnass pronounces the Radio Shack PRO-67 portable a fast scanner with the good image rejection expected of triple conversion circuitry (page 94).

HR2369: Another Specter Looms for Radio Listeners**An editorial feature by Bob Grove**

If HR2369 has its way, *verboten* will be tuning in to business band frequencies (good-bye NASCAR), public safety frequencies which share trunked frequencies with SMR (good-bye 83% of 800 MHz public safety communications), and anyone caught manufacturing, selling, or importing a receiver which picks up these frequencies would be subject to a whopping fine and imprisonment.

This Bill goes on to criminalize merely listening to—rather than misuse of—prohibited frequencies. And exactly which frequencies are affected is extremely unclear. If this Bill's intent was to further protect cellular and paging communications, it is like trying to hit a mosquito with a salvo of buckshot.

As creatively illustrated on our cover, Congress fantasizes that it can surgically carve out specific frequencies without killing the scanner industry. It's not that simple. Cellular and paging services need to encrypt, and Congress needs to take down the fence and listen to the voices of its constituents. See page 8 for background.

Radio That's Out of This World 14**By Philip Gebhardt**

Radioastronomy may sound like a hobby that's out of the league of the average hobbyist, but you may already have heard meteor signals on your shortwave, FM, or TV receiver without knowing it. With several major showers due this fall, stay warm and dry while watching meteors—by radio.

**Emergency Medical Services 20****By Ed Muro**

The Emergency Medical System has transformed our health care system since it was inaugurated in 1966. Its effectiveness is due in part to the close coordination with other medical and rescue services. EMS radio traffic is prime listening for off-duty personnel, first-responders, volunteers, and many private citizens.

Shortwave & Satellites & Cyberspace 23**By George Wood**

When George Wood's *Sweden Calling DXers* evolved into *Media Scan*, it was a sign of the times—not necessarily one of his choosing. In the intervening years the changes have taken broadcasting onto the Internet as well. Wood's insightful article looks at the evolution of international broadcasting from all perspectives and finds everyone has something to gain.





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| | | | |
|--------------------------------------|----|----------------------------------|-----|
| Letters | 4 | Plane Talk | 76 |
| Communications | 6 | Windshear - The Unseen Enemy | |
| PCS Front Line | 28 | Federal File | 78 |
| Brand names for PCS standards | | "Privatizing" Federal Comms | |
| Scanning Report | 30 | Satellite TV | 80 |
| Acts of Congress-II | | Satellite Radio for Your Car | |
| Utility World | 34 | Experimenters Workshop | 82 |
| Military Frequency Bonanza | | WiNRADiO - SMT Device Primer | |
| Global Forum | 38 | Computers & Radio | 84 |
| Respect for NA Neighbors | | Radiorraft, SWRL updates | |
| QSL Report | 42 | Digital Digest | 86 |
| English Lang SW Guide | 43 | Major Protocols | |
| Propagation Conditions | 63 | Review | 88 |
| Let's Talk the Same Language-II | | Opto Micro DTMF Decoder | |
| Beginner's Corner | 64 | What's New | 89 |
| When Any Q Won't Do | | Magne Tests | 92 |
| Below 500 kHz | 66 | Lowe SRX100/Target HF-3 | |
| We Have Winners! | | Scanning Equipment | 94 |
| American Bandscan | 68 | Radio Shack PRO-67 | |
| Myths of the Domestic Dials | | Tracking the Trunks | 96 |
| Outer Limits | 70 | Hex Conversions Made Easy | |
| FM Pirates Increasingly Active | | Antenna Topics | 98 |
| On the Ham Bands | 72 | Thoughts on Multiband Antennas | |
| Lectrokit SP-1B Spider | | Ask Bob | 100 |
| Special Events/Club Circuit | 73 | Repairing Smudged Displays | |
| DeMaw's Workbench | 74 | Stock Exchange | 102 |
| Feed-line Tips, Equipment Protection | | Closing Comments | 104 |
| | | America's Cacophony to the World | |

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GroveNet hosts the following managed lists free of charge to the hobby.

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| acars | ACARS mailing list |
| amfmtdx | AM/FM/TV DX mailing list |
| code30users | Hoka Code 30 demodulator users |
| code3list | Hoka Code 3 and Code 3 Gold decoder users |
| fedcom | Federal Communications |
| hearsat-1 | HearSat-1 Mailing List |
| milcom | Military HF/VHF/UHF communications monitoring |
| scan-dc | Scanner radio topics in Washington, DC - Baltimore |
| trunkcom | For discussion about the new TrunkTracker scanners |
| wun | Worldwide UTE News Club List (Nonbroadcast SW Radio) |

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DRAKE

A Fond Farewell to Larry Miller

Larry Miller has decided it's time to turn his attention to other endeavors and has submitted his resignation to *Monitoring Times* with this issue (see p. 6). Although Bob Grove, as founder of *Monitoring Times*, initiated the magazine's basic approach and style, it truly came into its own when Larry Miller joined the team in July 1986. He courted and won a top-notch staff of writers—most of whom are still with the magazine today. Additional hours were spent hammering out *MT*'s characteristic philosophy and approach in countless phone calls with the writing staff.

The groundwork laid by Larry Miller made it a relative breeze for me to step into the editor's position, but the fact that he stayed on to edit two columns was the greatest gift he could have given—both to the magazine and to myself. Although Larry's talents were somewhat stifled in the *What's New* section, his creativity was obvious in his sometimes off-beat treatment of radio news in *Communications*. I have appreciated his help, his humor, his

perspective on life and on radio, and his friendship. We will all miss you greatly, Larry.

Bob Grove, as publisher and first *MT* editor, has high praise for Larry.

"It's always hard saying 'Goodbye' to an old friend, and Larry Miller has been a professional colleague for more years than either of us would care to admit. But I understand his decision. Larry has an active, inquisitive mind; he is always looking for new avenues, new opportunities, new challenges. I commend his enthusiasm for writing, admire his ability in front of a computer (remember when it was a typewriter, Larry?), and wish him all the best in his new direction. Most of all, I thank him for sharing his wisdom, dedication, and friendship for all these years."

Monitoring Times and the radio hobby owe you a big debt of thanks, Larry. May you never lose your love for radio—it's in your blood, you know it is—

Ocean Hopper

Several of you were inspired to write regarding the August "Ocean Hopper" article. Let's start with a note from the author, Al Cikas, KA9GDL, who found a few omissions in our redrawn schematic. He says, "First, the unmarked grid resistor on the 6AT6 detector is 1 megohm. Second, the grid and cathode pins of the 6AQ5 are unmarked as well. The grid is tied to pins 1 and 7, the cathode is tied to pin 2."

Letters from Jack Roubie K2JDD, E. Syracuse, NY; Bruce Camlin N3TSQ, Baden, PA; and Ross Smith, Fallston, MD, all agreed that, although each writer owned a different model of the radio, all models were unsafe.

Here are excerpts from Ross Smith's letter: "I purchased an Ocean Hopper kit in the late 1950s...As you stated, the Ocean Hopper does not have enough volume to drive a speaker on all but the strongest stations. I replaced the band set dial with a vernier dial

and added a 12AT7 dual triode stage between the 12AT6 and the 50C5. The 35W4 was removed, the 50C5 circuit was moved over to the 35W4's former location, and the 12AT7 was wired in the 50C5's former location. A 300 ohm resistor was substituted for the 200 ohm resistor in the filament circuit, a selenium rectifier replaced the 35W4, and a potentiometer was added between the two triodes as a volume control. With the added amplification the set now had room filling volume on almost any station.

"The Ocean Hopper has survived several moves and was packed away in the basement when the latest issue of *Monitoring Times* came in the mail. After reading your article, I took my modified Ocean Hopper out of 'mothballs,' attached an antenna and speaker and turned it on. It still works.

"I have to agree with you that it is an unsafe piece of equipment. I try to keep one hand behind my back when measuring voltages, etc. with the cover off. Your redesign of the circuit using a power transformer and a 6AQ5 is a tremendous improvement. A 12AT7 or one of its relatives (stronger 12AX7 or weaker 12AU7) can be added to your circuit using its 6.3 volt filaments in parallel or in series for 12.6 volts.

"Thanks for bringing back fond memories."

Breaking the Cellphone Habit

Dave Stark, NF2G, editor of *Scanner Master Upstate New York Guide*, has this suggestion to make. "From now on, in all

(Continued on page 102)

Larry Cole, N4IWP
President Athens Radio Club
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Thanks for the Memories

Before we get started this issue, I wanted to let you know that I have handed in my resignation from *Monitoring Times*. To say that this was a difficult decision is a major understatement. I have written for this magazine and its predecessor, *International Radio*, for fifteen years.

The truth is that I could write a hundred pages about my experiences at *MT*. I'd want to tell you about Bob and Judy Grove, their compassion and integrity. These are some of the finest folk I have had the privilege to meet and knowing them helped melt my cynicism about people. Please continue to support the Groves in whatever they do.

Editor Rachel Baughn has become of friend of ten years. We have been through much together. We even flip-flopped jobs. At one point she worked for me; several years later, I was writing for her! The time together was all too short; I will miss having a reason to talk with her.

And you! We may have met at one of the conventions. It's possible that we exchanged a few letters or maybe you were kind enough to call or send in a newspaper clipping. Maybe we never crossed paths in any other way than in the fact that you subscribed to this magazine. No matter: please accept my thanks. It is rare indeed for a person to be able to work in the hobby that they love, to wake up every morning and know that they are going to have fun. You, by your participation, gave that gift to me. Please allow me to say thank you. It's been a wonderful life. Thanks for being a part of it.

—Larry Miller

Burning Bridges

The BBC is known for its formalism, even starchiness. So when veteran BBC-TV broadcaster Alan Towers did a little editorializing, it took viewers — and no doubt management — by surprise. At the conclusion of the 5:25pm newscast, Towers announced his resignation. "After 25 years I'm leaving the BBC. When I joined, it was led by giants. Now it's led by pygmies in grey suits wearing blindfolds. How that?" You could hear a pin drop.

The eight-second outburst took the show's producer by surprise as the broadcast was not scheduled to be Mr. Tower's last. All of that probably changed rather quickly, though.

One Adam 12, 10-99 in Progress

Pandemonium ruled on West South Street in Frederick, Maryland, when two baby ducklings tumbled into a storm drain. The mother duck paced nervously nearby as Michael Vlahos, who witnessed the event, called police.

Before long the news was dispatched out over the airwaves: baby ducks down sewer

drain! Officer Joe Bourke arrived, but even Frederick's finest was helpless to assist until Oscar Shankle arrived with his tow truck. Shankle, who heard the report on his scanner, backed the truck up to the storm grate and pulled it off with the tow hook. Before long, the baby ducks were reunited with mama duck.

Smiles were all around as a photographer for *The Frederick News* took congratulatory pictures. Another triumph for scanning. Front page news in Maryland, it was.

Scanner Listener is Hero

Workers in the downtown Birmingham, Alabama, BellSouth building may have a scanner listener to thank for their lives. Sheron Halmark said that the building's fire alarms didn't go off and the only way she knew there was a fire was from the scanner she keeps at work.

Halmark alerted her boss, who called security and then told workers to leave the building. Meanwhile, heat was coming out of the air vents; the lights soon went out, too.

"Instead of listening to the radio," Halmark told reporters, "I listen to my police scanner because you never know what's going to happen." Like baby ducks in a storm drain. The fire was confined to one room. No injuries were reported.

"How humiliating—rescued from a sewer drain..."



"Actually, Debbie, since you're going to be in school all day, how about dropping me at Ken's house?"

Computer Control

If you thought computer controlled scanning was hot, wait until you see what they've done to Barbie. Equipped with a computer chip, Mattel's "Talk With Me Barbie" will be able to chat about dozens of subjects and call children by name. Using a CD-ROM that comes with the doll, kids can program Barbie's thoughts.

Not only does the talking Barbie expound upon subjects of interest to those who program her but her lips move in sync with the words. The doll is due in stores November 1 and is expected to sell for \$89.

Radio Garbage

An Ohio man is in hot water after investigators saw him dump a radio in the garbage can behind a fast food restaurant. Gary Goodmanson, former president of the International Brotherhood of Electrical Workers local in Mentor was the suspect in a three-month long string of phoney distress calls that plagued the Coast Guard's Fairport Harbor station east of Cleveland. One of the calls brought rescuers out in 30 mile-an-hour winds to fight 15-foot tall waves during a search for a sinking ship with 21 people aboard. Air and water rescue crews from three states were involved.

The Federal Communications Commission tracked some of the bogus calls to Goodmanson's condominium. Investigators subsequently took a scanner, radio transmitter, and other marine equipment from the home. Goodmanson was arrested about 4 hours after the Coast Guard received a call on the marine band from a man reporting that his boat was out of gas and drifting on Lake Erie. A two-hour search of 36 square miles of water turned up nothing. Mentor police then saw Goodmanson leave his house, go to a restaurant, and dump the radio in a garbage can.

Goodmanson pled guilty to three misdemeanor charges in municipal Court then was taken to U.S. District Court in Cleveland where he was charged with interfering with government communications. If convicted



"Wow, when MT said that some people wanted to trash scanning, they really meant it!"

on the federal charge, Goodmanson could be subject to six years in

prison and a \$250,000 fine. He could also be required to pay for the needless search of Lake Erie.

Conversation with the FCC

Pirate radio was the topic of reporter Michael Canning's article. Included were these interesting quotes from Ralph Barlow, Tampa director of the Federal Communications Commission.

FCC agents don't have the authority to burst into a house and make arrests or confiscate equipment. "Our normal procedure is...administrative... We basically tell them to stop, and if they don't stop we [forward the case to the U.S. attorney's office.]"

The U.S. attorney's office could issue arrest and seizure warrants, which would be carried out by U.S. marshals with FCC agents accompanying as advisors. Regarding the possibility of this happening, Barlow relates that "[It is] a prohibitive amount of red tape for the FCC. You have to consider that the U.S. attorney has other things to deal with — drugs and everything else under the sun — besides this. So they handle these cases in accordance with their priorities, just like we do."

"We [the FCC] have priorities in investigations. Safety of life naturally comes first. That means ensuring the non-interference of fire, police, Coast Guard, and other emergency service radio frequencies."

In the Tampa area, Barlow says there are three cases against pirates with the U.S. attorney: 87X, 102.1, and 96.7 FM. But nobody is holding their breathe, at least not until a U.S. District Court in California rules on the controversial Radio Free Berkeley case. Twice in 1995, the judge refused to issue an injunction against that pirate.

Barlow admits some puzzlement about pirate radio. "As for these people who are thumbing their nose at federal authority, I can't really answer for them. There's such a

variety out over the air... I can't believe that nobody can find what they want to listen to...on the licensed stations."

Quick Cash

Want to make \$5,000? KZZU in Spokane, Washington, says it'll pay that much to anyone who helps them catch the radio jammer that's plaguing their airwaves. Since May, someone has been adding "editorial comments" like "KZZU sucks" to the station's rock music lineup.



According to program director Ken Hopkins, the messages are probably taped since they repeat over and over. "I just got a call from listener who said he was driving with his kids when suddenly, over the air, he heard a string of obscenities and then an announcement that Santa Claus had just been shot."

KZZU originally tried to take on the jammer by making fun of him on the air and asking listeners to try and catch him on tape. The jammer has been "dark" for a while, a reaction to announcements on local TV that the station would aggressively pursue him.

There was one last broadcast, though. The jammer announced that if listeners wanted to hear more of what he had to say, they should tune in to Channel 7 or 13 on their CB radios.

Communications is written by Larry Miller with editorial assistance from Rachel Baughn, Larry Van Horn, and the *MT* art department. We also receive help from the loyal members of our "communications" monitoring team who clip out and send in interesting items about communications, the absurd, and the world at large: Dave Alpert, New York, NY; Anonymous, Albany, NY; Harry Baughn, Brasstown, NC; David Beck, Birmingham, AL; Bill Craig, Burbank, CA; Maryanne Kehoe, Atlanta, GA; Elbert May, Grayville, AL; Officer John Malloy, Brook Park, OH; Ken "Quack, Quack" Martin, Thurmont, MD; Daryl Symington, Holland, OH; Dr. Sue Pennington III, Philadelphia, PA; and Wilbur Yancy, Claims Depo, AZ. We also consulted the following publications and list their names in appreciation: *Dispatch Monthly*, *Radio World*, *Satellite Times* and the *W5YI Report*.

Rave Review
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April '96

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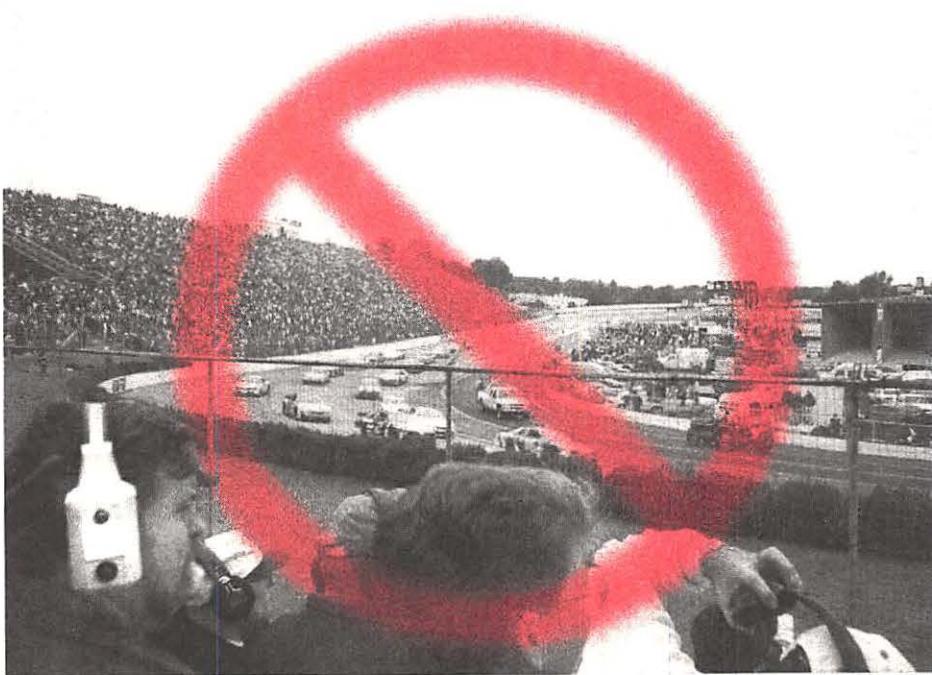
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HR 2369



Are the scanner listeners in the crowd at this NASCAR event doing something illegal? They will be if HR2369 becomes law. This ban on the business band would make listening to NASCAR drivers and even the manufacture of such radios illegal!

Another Specter Looms for Radio Hobbyists

An Editorial Feature by Bob Grove, Publisher, *Monitoring Times*

HR 2369 is the broadest-sweeping anti-scanner Bill ever written in the name of privacy protection; if literally enforced it would virtually eliminate the scanner industry, and impact on the shortwave and satellite communities as well.

Even a generous interpretation forbids reception of frequencies used by NASCAR teams, removes police and fire communications in some communities, and affects agencies such as the Civil Air Patrol—communications which the public uses on the job, in community volunteer work, for entertainment, and for education.

The penalty for any person who manufactures, modifies, imports, exports, or sells any device capable of receiving the prohibited frequencies also seems excessive—up to a \$500,000 fine and five years in prison! Also, no provision is made in this new Bill for grandfathering in older receivers. Is this the end of hobbyists swapping out older scanners and general coverage receivers at a hamfest in order to upgrade to newer equipment?

■ A Little History

In 1986, the Cellular Telecommunications Industry Association (CTIA) successfully lobbied for legislation to prohibit the deliberate monitoring of mobile telephones. The resulting Electronic Communications Privacy Act (ECPA) did little to discourage curious scanner listeners from tuning in on cellular and other mobile telephones. At that time, the CTIA promised it would soon offer digital encryption to provide privacy to its customers.

In 1993, again prompted by the CTIA, Congress directed the Federal Communications Commission (FCC) to deny certification to any scanner which received, or could be readily altered to receive, cellular telephone frequencies.

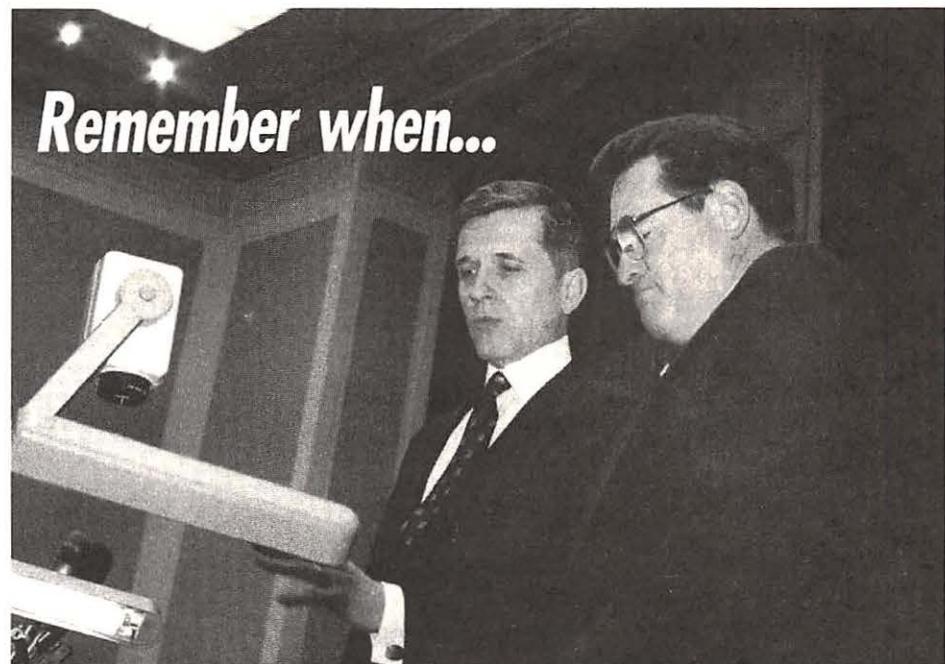
However, because of the number of cellular-capable scanners on the market, and the ready alteration of many new models which were already certified, scanner listeners still had an open line to phone calls. The long-promised encrypted communications were still not

available except as an expensive add-on, paid for by the consumer.

On February 5th, 1997, hearings at the House Subcommittee on Telecommunications, Trade, and Consumer Protection convened, focussing on the continued vulnerability of cellular telephones to scanner eavesdropping. The hearings were prompted by the embarrassing disclosure that one of their own, Newt Gingrich, had been overheard on a cell phone conversation which implicated him in a strategy to evade a provision of the Ethics Committee. The conversation was overheard and recorded by a Florida couple using an unaltered Radio Shack PRO-51 scanner.

Rather than recognize the failure of the cellular industry to utilize readily-available voice encryption technology—eleven years after it was promised—the blame for the ease of interception was once again placed on scanner owners who were categorically characterized as “high-tech eavesdroppers.” Representative Edward Markey (D-MA), the author of the 1993 amendments and the most animated and vocal of the Subcommittee members, promised we would “see scanner sales drop precipitously.” He appears to be keeping his word by introducing HR1964 (see September 1997 *MT*).

It is clearly less expensive (though less effective) to try to get Congress to repeal the laws of physics than to implement encryption. This became apparent during the February hearing in which CTIA spokesman Tom Wheeler was invited to dominate the proceed-



CTIA spokesman Tom Wheeler (left) and Subcommittee Chairman Bill Tauzin discuss the modification of a scanner during the February Congressional hearings. Oddly enough, the radio chosen for “restoration” was a Radio Shack PRO-26 — a scanner no one else has succeeded in restoring.

ings while other witnesses were denied the courtesy of reply or rebuttal.

During that hearing, a carefully-rehearsed demonstration between Wheeler and Subcommittee Chairman Billy Tauzin (R-LA) purported to show how easy it was to restore cellular coverage on a scanner—in this case, according to a Radio Shack official, a PRO-26. Curiously, this model has not been reported restored by anyone else and, although

withdrawn from the market because of the hearing, remains FCC certified!

■ Legislation Looms over the Industry

On June 19th, Markey submitted to Congress HR1964, a Bill intended to provide sweeping changes to both Internet practices and scanner enforcement. Much of the wording, including the substitution of “Commer-

The Target: Commercial Mobile Radio Service

Rep. Tauzin says it's not true that his Bill will deny racing fans their radios, but the case seems pretty clear. Let's take Jeff Gordon's team, for example. They've been heard on 467.0625 and 469.4875 MHz. Do you see those frequencies listed below under the prohibited Commercial Radio Service? Of course you do! The new law will prohibit the manufacture, sale, or even listening to any radio that covers these frequencies!

1) Private Paging Services

Private carrier paging system (PCPS): 929-930 / 931-932 MHz

2) Business Radio Services

VHF low band: 30.76-31.24 (9 discrete freqs) / 33.14-33.16 / 33.40 / 35.02-35.14 / 35.18 / 35.7-35.72 / 35.88-35.98 / 42.96-43.00 MHz

VHF Hi-band: 151.625-151.955 / 154.570-154.600 MHz

UHF band: 457.525-457.600 / 460.650-462.1875 / 465.650-467.1875 / 462.750-462.925 / 467.750-467.925 / 463.200-465.000 / 468.200-470.000 MHz

There are also a number of chunks of the 470-512 MHz that will be removed.

3) Specialized Mobile Radio (SMR) Services

851-866 (806-821 MHz) / 935-940 (896-901 MHz)

(home to many public safety agencies for whom there wasn't room in the 866-869 MHz portion)

4) Land Mobile Services in the 220-222 MHz region (recent regulations have turned this over to the CMRS)

5) Public Mobile Services

A) Paging and Radiotelephone Services

35.2-35.66 / 43.2-43.66 MHz / 152.030-152.240 / 152.480-152.840 MHz

154.625 / 157.740-158.100 / 158.460-159.700 MHz

B) Cellular Radiotelephone Service

869-894 MHz (824-849 MHz mobiles)

C) 454 MHz Air-Ground Radiotelephone Service

454-455 MHz (459-460 MHz mobiles)

D) 800 MHz Air-Ground Radiotelephone Service

894-896 MHz (849-851 MHz mobiles)

6) Offshore Radiotelephone Services

7) Satellite Mobile Services

137-138 MHz NVNG (148-150.050 uplinks) / 399.9-400.050 / 1525-1559 / 1610-1660.5 MHz

8) Personal Communication Services (PCS)

901-902 / 930-931 / 940-941 / 1850-1990 MHz

cial Mobile Radio Service" for "domestic cellular radio telecommunications service," in Markey's Bill appears to have come from a study by the Center for Democracy and Technology, released in June 1997, entitled "Communications Privacy in the Digital Age."

Nearly every endorsing organization for this study is a lobby for the paging, cellular, or wireline telephone companies. Jerry Berman, head of the Center (which was formed in Dec 1994), was instrumental in drafting the ECPA of 1986. It is ironic that this organization, so principled in its fight for free access to information on the Internet, should have—in the name of privacy—so dramatically curtailed public access to the airwaves.

Fortunately for the scanner industry, HR1964 has not at this writing found any co-sponsors, nor is it scheduled for a hearing.

However, on July 31, Tauzin introduced HR2369, a nightmarish proposal which not only includes *all* of Markey's scanner-related prohibitions, but even changes the provisions of the original 1934 Communications Act (see accompanying Bill text). The simple expedient of replacing the word "and" with the word "or" now criminalizes the mere act of overhearing a communication protected by the Bill, even though it's transmitted without encryption, rather than penalizing the illegal use of such communication.

If literally enforced, HR2369 will virtually eliminate the scanner industry, an estimated \$200 million annual market; additionally, its ambiguous language impacts on the shortwave community as well since utility (nonbroadcast) communications occupy 78% of the frequencies below 30 MHz.

■ Accidental or Insidious?

Perhaps HR2369's authors simply don't understand their own Bill. We live in a technical era and few, if any, members of the Subcommittee are trained in telecommunications. Errors of commission, omission, and contradiction are rife in the Bill. Admittedly, Part A would seem to allow monitoring of public safety communications, but Parts B and C do not. If removal of public safety communications from Americans' radios is not an intent, as we are reassured by Tauzin's office, then why remove frequencies allocated to these services?

According to a Tauzin spokesperson, the Bill's intent is to ban any scanner capable of receiving mobile phone frequencies used by the Commercial Mobile Radio Service (CMRS). But, as seen in the accompanying sidebar, CMRS includes a great deal more than cellular phones and paging services. Of

HR 2369 IH 105th CONGRESS 1st Session

[Original text has been inserted where needed for meaning, with strikeouts and new text in bold.]

To amend the Communications Act of 1934 to strengthen and clarify prohibitions on electronic eavesdropping, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

July 31, 1997

Mr. TAUZIN (for himself, Mr. MARKEY, Mr. OXLEY, Mr. GILLMOR, Ms. ESHOO, and Ms. McCARTHY of Missouri) introduced the following bill; which was referred to the Committee on Commerce

A BILL

To amend the Communications Act of 1934 to strengthen and clarify prohibitions on electronic eavesdropping, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the 'Wireless Privacy Enhancement Act of 1997'.

SEC. 2. COMMERCE IN ELECTRONIC EAVESDROPPING DEVICES.

(a) PROHIBITION ON MODIFICATION- Section 302(b) of the Communications Act of 1934 (47 U.S.C. 302(b)) is amended by inserting before the period at the end thereof the following: 'or to modify any such device, equipment, or system in any manner that causes such device, equipment, or system to fail to comply with such regulations'.
TO READ: No person shall manufacture, import, sell, offer for sale, or ship devices or home electronic equipment and systems, or use devices, which fail to comply with regulations promulgated pursuant to this section, **or to modify any such device, equipment, or system in any manner that causes such device, equipment, or system to fail to comply with such regulations**.

(b) PROHIBITION ON COMMERCE IN SCANNING RECEIVERS- Section 302(d) of such Act (47 U.S.C. 302(d)) is amended to read as follows:

(d) The Commission shall prescribe regulations denying equipment authorization (under part 15 of title 47, Code of Federal Regulations, or any other part of that title) for any scanning receiver that is capable of--

(1) receiving transmissions in the frequencies allocated to [the domestic cellular radio telecommunications service] **any commercial mobile service (as defined in section 332(d))**,

(2) readily being altered [by the user] to receive transmissions in such frequencies, [or]

(3) being equipped with decoders that convert [digital cellular transmissions] **digital commercial mobile service transmissions** to analog voice audio, or

(Continued on next page)

(4) being equipped with devices that otherwise decode encrypted radio transmissions for the purposes of unauthorized interception.'

(c) IMPLEMENTING REGULATIONS- Within 90 days after the date of enactment of this Act, the Federal Communications Commission shall prescribe amendments to its regulations for the purposes of implementing the amendments made by this section. In prescribing such amendments, and in response to subsequent changes in technology or behavior, the Commission shall review and revise its definition of the term 'capable of readily being altered' as necessary to prevent commerce in devices that may be used unlawfully to intercept or divulge radio communication.

SEC. 3. UNAUTHORIZED INTERCEPTION OR PUBLICATION OF COMMUNICATIONS.

(a) AMENDMENTS- Section 705 of the Communications Act of 1934

(47 U.S.C. 605) is amended--

(1) in the heading of such section, by inserting 'interception or' after 'unauthorized';
TO READ: Unauthorized **Interception or** Publication or Use of Communications

(2) in the second sentence of subsection (a), by striking 'and divulge' and inserting 'or divulge';
TO READ: No person not being authorized by the sender shall intercept any radio communication **[and divulge]** or **divulge** or publish the existence, contents, substance, purport, effect, or meaning of such intercepted communication to any person.

(3) in subsection (e)(1)--

(A) by striking 'fined not more than \$2,000 or'; and (B) by inserting 'or fined under title 18, United States Code,' after '6 months,'; and

TO READ: Any person who willfully violates subsection (a) of this section shall be **[fined not more than \$2,000 or]** imprisoned for not more than 6 months **or fined under title 18, United States Code**, or both.

(4) in subsection (e)(3), by striking 'any violation' and inserting 'any receipt, interception, divulgence, publication, or utilization of any communication in violation'; and
TO READ: (3)(A) Any person aggrieved by **[any violation]** **any receipt, interception, divulgence, publication, or utilization of any communication in violation of subsection (a)** of this section or paragraph (4) of this subsection may bring a civil action in a United States district court or in any other court of competent jurisdiction.

(5) in subsection (e)(4), by striking 'any other activity prohibited by subsection (a)' and inserting 'any receipt, interception, divulgence, publication, or utilization of any communication in violation of subsection (a)'.

TO READ: (4) Any person who manufactures, assembles, modifies, imports, exports, sells, or distributes any electronic, mechanical, or other device or equipment, knowing or having reason to know that the device or equipment is primarily of assistance in the unauthorized decryption of satellite cable programming, or is intended for **[any other activity prohibited by subsection (a)]** **any receipt, divulgence, publication, or utilization of any communication in violation of subsection (a)** of this section, shall be fined not more than \$500,000 for each violation, or imprisoned for not more than 5 years for each violation, or both. For purposes of all penalties and remedies established for violations of this paragraph, the prohibited activity established herein as it applies to each such device shall be deemed a separate violation.

(b) RESPONSIBILITY FOR ENFORCEMENT- Notwithstanding any other investigative or enforcement activities of any other Federal agency, the Federal Communications Commission shall investigate alleged violations of section 705 of the Communications Act of 1934 (47 U.S.C. 605) and may proceed to initiate action under section 503 of such Act (47 U.S.C. 503) to impose forfeiture penalties with respect to such violation upon conclusion of the Commission's investigation.

most concern are public safety systems, which are currently legal to monitor, and which share frequency spectrum with Specialized Mobile Radio Services (SMR).

SMR and Business Band systems are classified in the Commercial Mobile Radio Service because they both interface with wire communications which are protected. With passage of this bill the reception of police, fire, ambulances, local government, and NASCAR racing teams utilizing 800 MHz frequencies would become illegal; scanners receiving those frequencies would lose their type acceptance.

With the passage of HR2369, 83 percent of the 800 MHz public safety frequencies would be lost, drastically limiting the use of trunk tracking scanners. Would manufacturers find it worth their while to produce scanners—already a minor market—if they are forced to omit the frequencies of greatest interest?

The impact on news media is also obvious; there is a well-established liaison between the media and public safety organizations for news gathering. With monitoring of these services outlawed, such leads would become non-existent. Citizen reports to police agencies, enabling apprehension of suspects described over the air, would cease, crippling

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this source of leads. Citizen watch teams and off-duty firefighters who monitor with low-cost scanners would be a thing of the past.

Additionally, the Bill appears to prohibit the monitoring of other services not intended for public reception, apparently including many satellite services. Would we lose C and Ku band downlinks, NASA shuttle audio, perhaps even weather satellite monitoring? Amateur radio would be severely restricted, since transceivers could no longer incorporate wide-coverage receiver sections, severely handicapping Military Affiliate Radio Service (MARS), Civil Air Patrol (CAP), and other auxiliary public service efforts during natural disasters, plane crashes, and public welfare and morale communications.

The Bill is perplexing. Was it written by someone so inept and inexperienced that it is almost totally unusable? Does the writer simply not understand the radio spectrum and its users? Is the broad sweep intentional, designed for negotiative room with its opponents? Is it merely written to placate the CTIA so that, if it fails, the Subcommittee members can still tell their special interests, "Well, we tried!"?

Or is it really an intentionally punitive legislation, inexpertly "designed by a committee," making their job easier by catering to their contributors and mandating the struggling FCC with its enforcement? This would be a characteristically simplistic, although unconscionable, solution to a complex technological problem.

■ Call to Action

We strongly believe in our citizens' right to privacy, but the onus of privacy protection is on the service provider, not the hapless hobbyist who could face an extended prison sentence and loss of his life savings after he overhears any one of an overwhelming number of clear voice transmissions.

Action on the Bill could come at any time—remember, the 1993 censoring of full-frequency-coverage scanners was deliberately added on as an eleventh-hour amendment to another Bill in front of a weary Congress eager to adjourn. If we allow this type of underhanded, PAC-funded manipulation to be repeated, we deserve to lose our traditional right of access to the airwaves.

Write, call, or e-mail your Congressional representative and voice your opposition to HR2369. We reprint a letter by Rachel Baughn as a sample; several other letters can be found at the KyScan web site <http://www.uky.edu/~hpeach/congress/locate.htm>

Tell your local news media they are also being targeted. Agent Kallstrom, FBI Assistant Director, NY Division, claimed monitoring by the press forced the Federal Bureau of Investigation to abandon use of cellular phones during the TWA 800 crash investigation. Laws already on the books prohibit such invasive listening.

This alleged incident and the improper

publication of Gingrich's phone conversation should not be used as justification for broadening the scope of "illegal" frequencies. To do so damages legitimate uses of radio and removes the responsibility from those who should bear it: the communications services which owe it to their customers to provide encryption, and those who are violating existing laws regarding use of radio communications.

Going to Bat for Radio Monitoring: A Suggested Letter to Congressmen

The Honorable _____
United States House of Representatives
Washington, D.C. 20515

The Honorable _____
United States Senate
Washington, D.C. 20510

Dear Representative/Senator,

I am writing to urge your opposition to HR 1964 (*The Communications Privacy and Consumer Empowerment Act*), which would ban radio scanners capable of reception of the commercial mobile radio services (CMRS), and to HR 2369 (*The Wireless Privacy Enhancement Act*), an even more repressive bill.

HR 2369 and HR 1964 both contain the same prohibition of CMRS in scanners. Millions of hobbyists who tune in local police, fire, rescue, NASCAR drivers, and other two-way radio traffic could be branded outlaws, just because they share frequencies with cellular and paging services. Simply listening to any of these currently-allowable communications would make you subject to imprisonment and a fine.

However, HR2369 goes even further to completely ban third-party reception of any non-broadcast radio reception, and the manufacture of receivers which can pick up non-broadcast signals. There are exceptions which may be extremely narrow or relatively generous, depending on how the FCC chooses to interpret the Bill's ambiguous language.

In its strictest reading, shortwave hobbyists could be criminalized for listening to anything other than broadcasts such as the BBC or amateur radio operators; even the 6-million C-band and Ku-band satellite dish owners may be subject to this law. The overly-broad language of this bill dumps the good along with the bad in its attempt to provide privacy to the evolving personal communications technologies.

The obligation to make communications private lies with the providers who are selling the service and the equipment, and they should be held to the promise they made eleven years ago to do so. It is already illegal for a third party to use information gained through interception of a non-broadcast signal for profit or to aid in a criminal act. I ask that offenders of existing laws be justly prosecuted; but don't penalize harmless hobbyists and public service volunteers by outlawing all two-way reception outside of CB and amateur radio.

Please oppose HR 1964 and HR 2369. If the intent of both bills is to enhance privacy in personal communications systems, they both miss the mark: HR 1964 does not take into consideration the enormous variety of services that utilize frequencies in the Commercial Mobile Radio Service. HR 2369 repeats the error and goes even further to give the U.S. the most repressive radio legislation in the free world.

Respectfully yours,
Rachel Baughn
Editor, Monitoring Times

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| Priority | Any one channel |
| Search | 300 steps/second |
| Delay | Individual channel, 2-4 seconds |
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| Audio Output Power | 250 mW max. |

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| IF Selectivity | (-30 dB) 30 kHz AM/NFM |
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Radio That's Really...



A woodcut illustrating the famous 1833 Leonid meteor storm.

OUT OF THIS WORLD

By Philip Gebhardt, VA3ACK

For decades, both radio professionals and radio enthusiasts sought ways to enhance desired signals while suppressing both extraneous signals and noise.

Some of that noise included extraterrestrial radiation: noise from the Sun, the planets and the Milky Way galaxy. Included in the unexplained sources were signals from meteors.

Eventually things turned around and radio antennas were pointed toward the sky to detect non-terrestrial signals. The result was the beginning of radio astronomy.

Unfortunately, radio astronomy is associated with huge parabolic antennas; expensive, sophisticated receivers; cooled, low-noise amplifiers; ultra low-loss transmission lines; and extremely high frequencies. In short, everything beyond the amateur enthusiast's reach. But, in fact, radio astronomy need not be expensive nor complicated for the amateur.

While most amateur radio astronomers are aware of the work of Karl Jansky and Grote Reber [1] in the 1930s, radio astronomy has even earlier roots. Researchers were using radio to detect meteors in the

1920s. H. Nagaoka appears to be the first scientist to suggest that meteors might cause sufficient disturbance in the E region of the ionosphere to affect radio waves. [2] Nagaoka's findings appeared in the *Proceedings of the Imperial Academy of Tokyo* in 1929.

Later, E. Quaeck and G.W. Pickard set out to find the connection between meteors and disturbances on long-distance shortwave transmissions. In Japan, T. Minohara and Y. Ito investigated the effect of the 1932 Leonid shower. Their work was followed up in India by S.K. Mitra, P. Syam, and B.N. Ghose during the 1932 Leonid shower. Work during the 1936 Leonid shower was carried out by J.N. Bhar and reported in the *Indian Journal of Physics and in Nature*.

As it turns out, there isn't a much easier project (these days) in radio astronomy than the radio detection of meteors. Just imagine—if Nagaoka could detect meteors using the technology and information available in the 1920s, how easy it should be for you to detect meteors with the receivers and antennas available today.

In fact, you may have already heard meteor signals on your shortwave, FM, or TV receiver without knowing what you were

hearing. Figure 1 shows what happens.

There is no better, more exciting time to get involved with radio astronomy than right now. Why? Because the Leonid meteor shower is about to peak. With a known period of about 33 years and the last recorded peak in 1965 and 1966, we are due for a spectacular return. How spectacular is spectacular? Robert Hawkes of the Physics, Engineering and Geology Department at Mount Allison University in Sackville, New Brunswick, states in the 1997 edition of *Observer's Handbook* [3] that for a one-hour, high-peak period during the 1966 Leonid shower, meteors were detected visually at the rate of 150,000 per hour! And if that doesn't impress you, P. Clay Sherrod makes the statement in *A Complete Manual of Amateur Astronomy* [4] that "...at some times as many as 500,000 per hour—140 per second—were seen."

The magic date this year will be November 17. However, the shower has a duration of four days, so you should listen at least two days before and after this date.

For radio enthusiasts, this is an opportunity to hear signals you might otherwise not be able to receive. It is also a simple way to learn about signal propagation and the ionosphere.

Although much of the available information is based on reception in the FM broadcast band, the lower VHF TV band (channels 2 through 6) and the 6- and 2-meter amateur radio bands, meteor detection has been successfully attempted as low as 6 MHz [5]. Powerful shortwave stations were used in the early days of meteor detection. Laurence Manning described [6] hearing the signal from a 50-kW, 15.340 MHz shortwave broadcast station on the night of September 16, 1946. Manning and other researchers were also using radar techniques and CW transmitters in their search for meteors.

Amateur radio operators have been involved since the early days. Oswald G. Villard, Jr., W6QYT, described a technique for hearing doppler whistles from meteor trails in a *QST* article [7].

Both Villard and Manning were associated with the Electronics Research Laboratory of the Department of Electrical Engineering at Stanford University during the days of meteor research.

Although interest in meteor detection and meteor communications waned as research funds dried up and satellite communications flourished, there has been a resurgence of interest and activity recently. This is an opportunity for radio enthusiasts to make a valuable contribution and enjoy the hobby at the same time.

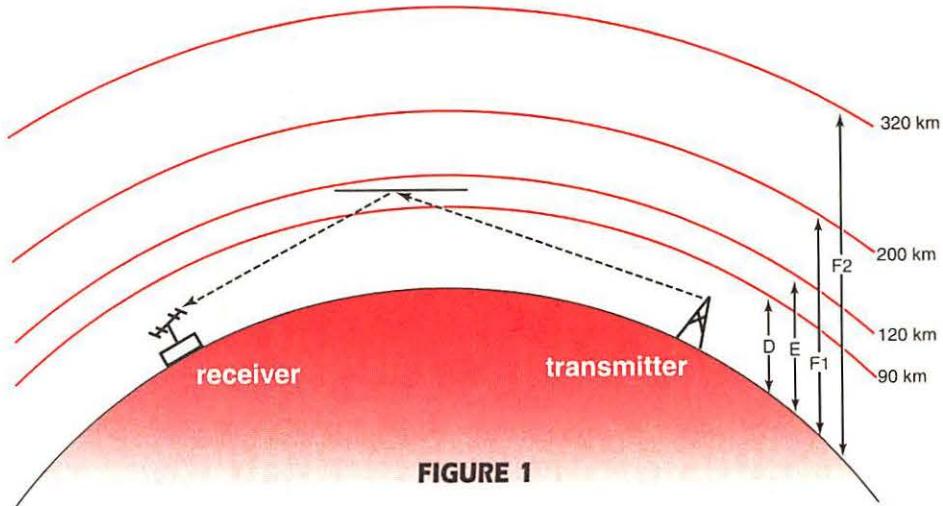


FIGURE 1

As a meteoroid enters Earth's atmosphere, it ablates at a height of 120 to 60 km. The meteoroid produces a meteor which includes a visible streak of light and an ionized column which can reflect radio signals. The height of the meteor is comparable to the E-layer of the ionosphere so FM and TV signals can be heard from distances similar to sporadic E signals.

■ Why Radioastronomy?

From an astronomer's perspective, the classic argument for the radio detection of meteors is that you can observe on nights when it is raining (or just cloudy). However, there are several other reasons to pursue radio detection techniques. Moonlight can impede visual observation, but not radio observation. There is also the problem of sunlight. No visual observations are possible during the day because the sky is generally too bright to see meteors. Radio detection, on the other hand, can be used night and day. As Gerald Hawkins put it, "...astronomers engaged in this work appreciate the full meaning of '24 hours per day, 365-1/4 days per year.'" [8]

There is also the consideration of what you can see and what your radio can hear. Table 1 shows the number of meteors which enter Earth's atmosphere each day classified by meteoroid particle size. Not only can you gather more information about meteors by radio observation than you can by visual observation because radio methods work 24 hours per day, but radio techniques can detect fainter meteors (weaker signals) than either visual or photographic methods. The end result is that on a typical night during which a visual observer might see perhaps 100 meteors, 500 to 1000 meteors can be recorded by radio means. [4]

And for those of us who live in the north, there's the added benefit of radio observing in the warmth of your radio shack rather than visual observing in the bitter cold outdoors. It may not seem important now, but next January you'll appreciate the difference!

So, how does this affect *MT* readers? Let's start with what you are listening for. Unlike

the Sun, Jupiter or other galactic sources which generate their own signals, meteors are passive reflectors of signals. Therefore, you won't be listening for crackles, hisses, or swishing sounds. You will be listening for terrestrial signals which are reflected by the meteor trail. (See Figure 1.)

As a meteoroid from outer space enters Earth's atmosphere, it not only produces the familiar streak of light known as a meteor (or shooting star), it also produces an ionized trail. John Pierce, a researcher in the early days of meteor detection by radio, estimated that a meteor weighing only one-quarter gram would produce an ionized trail 1 km (3280 ft.) in diameter and 100 km (60 mi.) long. Just like the ionized gases of the D, E, and F layers in the ionosphere, the ionized meteor trail is capable of reflecting terrestrial signals. As shown in Figure 1, a signal from a distant FM or TV station which is normally beyond listening range will be reflected by the ionized meteor trail and returned to Earth—and possibly to your FM or TV receiving antenna.

Just like the visual streak of light associated with meteors, the radio reflection takes place very quickly. It may last anywhere from a fraction of a second up to several seconds. Figure 2 shows the profile of a typical meteor-reflected signal. The signal rises very quickly out of the noise and then disappears quickly. About 90 percent of meteors follow this pattern. The other 10 percent will produce longer reflections—in some cases 15 to 30 seconds.

Although everyone's attention is on the upcoming Leonid meteor shower, you don't need to wait for a meteor shower to hear signals. Although there are dozens of major meteor showers each year, you can hear meteor signals any day of the year by listening for

TABLE 1: Properties of sporadic meteors

Sporadic meteor data. Many meteors enter Earth's atmosphere and ablate every day. Many are too small for visual detection, but can be detected by radio means. The mass distribution is such that the total mass of each of the particle sizes is constant. For example, notice in the table that each day 109 particles of 10.4 g mass ablate. However, during the same period 1010 particles of 10.5 g ablate. From this, it can be seen that the number of meteors detectable by radio means far exceeds the number detectable visually. Courtesy of Meteor Communications Corporation. Reprinted with permission.

| | Mass (g) | Radius (cm) | Number Swept Up by Earth per Day |
|---|-------------------------|------------------|----------------------------------|
| Particles that survive passage through Earth's atmosphere | 10^4 | 8 | 10 |
| Visual and radio detection | 10^3 | 4 | 10^2 |
| | 10^2 | 2 | 10^3 |
| | 10 | 0.8 | 10^4 |
| | 1 | 0.4 | 10^5 |
| Particles totally disintegrated in Earth's upper atmosphere | 10^{-1} | 0.2 | 10^6 |
| | 10^{-2} | 0.08 | 10^7 |
| | 10^{-3} | 0.04 | 10^8 |
| | 10^{-4} | 0.02 | 10^9 |
| | 10^{-5} | 0.008 | 10^{10} |
| | 10^{-6} | 0.004 | 10^{11} |
| | 10^{-7} | 0.002 | 10^{12} |
| Particles that can't be detected by radio | 10^{-8} to 10^{-13} | 0.0004 to 0.0002 | about 10^{20} |

sporadic meteors. (For an explanation of sporadic meteors and meteor showers as well as other astronomy terms used in this article, see "An Astronomy Primer" accompanying this article.)

Meteor showers have the advantages that the meteoroids (within a single shower) are traveling along parallel paths and that, for the duration of the shower, the meteor rate is higher than it is for sporadic meteors. As a result, you have more chance that successive meteors in the shower will continue the reflection process and you will be able to hear the reflected signal for a longer period than a second or two.

Table 2 gives data for some upcoming showers to get you started.

While meteor showers occur annually at predictable times, sporadic meteors appear at unpredictable times from unpredictable directions in the sky. Nevertheless, there is a predictable daily variation in the number of sporadic meteors detected. As shown in Figure 3, a peak in the number occurs in the early morning hours (normally around 6 a.m. local time) as meteoroids are swept up by Earth. A minimum occurs in early evening (about 6 p.m. local time).

It should be noted that in overall numbers, sporadic meteors outnumber shower meteors by 4 to 1.

■ How, Where, and When?

Now that you know how meteors reflect terrestrial radio signals and what you are listening for, you'll need to know how to hear the signals, where to listen and when to listen.

The "how" part is easy: Turn on your FM receiver and listen. Well, it's perhaps not quite that easy, but almost. Select a clear

frequency in the FM broadcast band. Remember that in North America the band starts at 88 MHz and ends at 108 MHz. However, the lowest assigned frequency is 88.1 MHz and the highest frequency is 107.9 MHz. Frequencies are assigned at 200 kHz intervals, that is 88.3, 88.5, 88.7 MHz and so on. In North America, there are no stations on 88.2 MHz, for example. Tuning to a frequency used by a local station is easy; tuning to a frequency on which there is no station to be heard can be tricky. Having a receiver with a digital readout makes the task easy. If you use a receiver with a dial and pointer, you'll need to estimate where the frequency is on the dial.

If you live in a large metropolitan area where clear frequencies are as scarce as hen's teeth, you may have to settle for a frequency with a weak signal.

You can connect an FM or FM/TV outdoor beam to your receiver. If you subscribe to cable TV and don't have an outdoor antenna on a tower, you can connect a dipole or folded dipole to your FM receiver. (See Figure 4.)

But where do you aim the antenna? If you

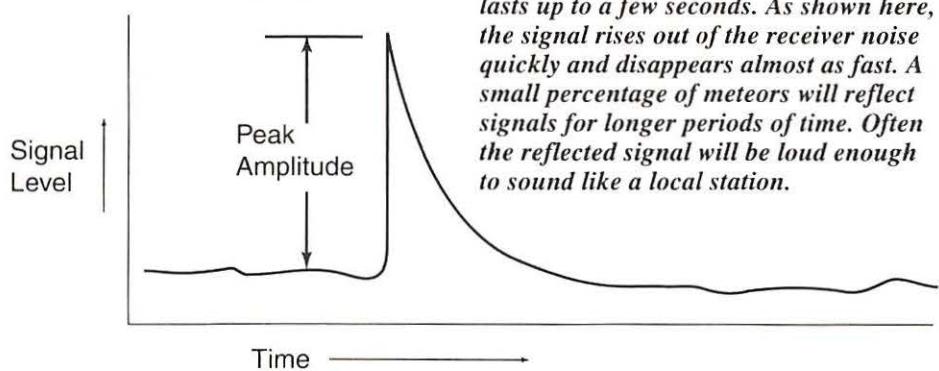
use a dipole and you want to detect sporadic meteors, string the antenna in an east-west direction so your best reception will be north-south. This also applies to a folded dipole and to the collinear antenna.) If you use a beam antenna, point the antenna south.

Now you can sit back (early in the morning for best results) and listen for sporadic meteors. You'll know when you hear a meteor, because the signal will quickly rise out of the noise and then disappear. You may hear a few notes of music or a few words. If you couldn't find a clear frequency and had to choose one with a weak, background station, you may find that the weak signal is enhanced briefly. In other cases, the weak signal will be momentarily swamped by another, more distant station.

When detecting sporadic meteors, the type of antenna you choose is academic. Beam antennas have higher gain than dipoles and therefore allow you to hear fainter meteors. On the other hand, beam antennas achieve gain by sacrificing beamwidth and so they 'see' less of the sky than dipoles do. Conversely, dipoles can only detect strong meteors, but because dipoles 'see' more of the sky, they detect strong meteors that are outside the beam of an FM beam antenna. Depending on your location and the time of day, the advantages of beams and dipoles balance out. In studies of meteor velocity conducted by Villard, Manning, and Peterson at Stanford University, a half-wave dipole mounted a quarter-wavelength above the ground was used as a receiving antenna. [2]

Beam antennas have the advantage when it comes to meteor showers. That's because these meteor trails reflect signals from predictable directions.

If you are using an FM or FM/TV beam on a tower, you can leave the antenna pointed at the horizon just as you would for normal reception. If you are considering dedicating a beam antenna to meteor detection, you might

FIGURE 2

The signal reflected by most meteor trails lasts up to a few seconds. As shown here, the signal rises out of the receiver noise quickly and disappears almost as fast. A small percentage of meteors will reflect signals for longer periods of time. Often the reflected signal will be loud enough to sound like a local station.

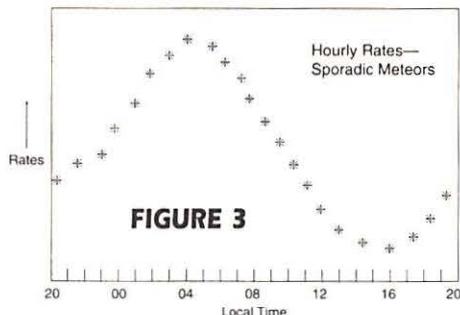


FIGURE 3

The rate at which sporadic meteors are detected varies throughout the day. The diurnal variation shown here clearly shows the maximum and minimum times as described by McKinley and Millman in their research [12]. Note that the detection rate does not drop to zero, but simply to a minimum value in the early evening.

consider setting the antenna at an elevation angle at 45° above the horizon. Japanese astronomers in the Nippon Meteor Society even pointed their beams straight up [9] to reduce noise from terrestrial sources.

You can get results using a 4-element beam; the Nippon Meteor Society astronomers used 5- and 7-element beams.

If you want to detect showers other than those listed in Table 2, you need to determine where to point your beam. You'll need a planisphere or a computer program designed for meteor work. Michael Owen, W9IP/2, has written one such program—aptly named

Meteor—which is available on the Internet or through amateur radio BBSs.

Using a planisphere, you can track the meteor's radiant as it travels across the sky. The best time to listen is when the radiant is between 30° and 60° above the horizon. The best direction to point your beam depends on the meteor's radiant. When the radiant is in the northeastern sky, listen for stations from the northwest and southeast. When the radiant is in the northern sky, listen for stations from the east and west. When the radiant is in the northwestern sky, listen for stations from the northeast and southwest. This pattern continues around the compass.

Using this technique, you will need to know where the meteor radiant is. An astronomy reference, such as *Observer's Handbook* [2], will provide you with the required information. Alternatively, visit the International Meteor Organization's web site (<http://www.imo.net>) where you will find information about meteor detection. To obtain information about specific showers look up their calendar (<http://www.imo.net/calendar/cal97.html>) where you will find information about meteor showers in general as well as daytime (radio) showers.

Although much of this article has focused on the FM broadcast band, the detection method applies equally well to the lower VHF TV band (channels 2 to 6).

There are two points to keep in mind. First, if you opt to listen on the FM band and use a TV beam, verify that an FM trap has not been inserted in the feedline. If there is one, remove it. Second, receiving meteor signals on a TV receiver precludes using cable TV. There will be no unoccupied channels to monitor, if you connect to cable.

Although listening on the FM or TV band is a compromise, they have major advantages. First, many stations are running high power—25, 50, or 100 kW. The strength of the reflected signal and the duration of the signal are dependent on transmitter power and transmitter antenna gain. Second, many FM and TV stations operate 24 hours a day. This means you should be able to hear a signal whenever a suitably-positioned meteor trail forms. Some of the early meteor research was conducted in the 60-70 MHz range. [10]

It is possible, and from a theoretical perspective desirable, to listen on lower frequencies. It's "theoretical" because you won't find any high-power stations with predictable schedules until the frequency dips to the international shortwave broadcast bands. You can listen to the mobile band (29.7-50 MHz), but transmitter power is low and operating times are unpredictable. The 10-meter amateur radio band is well-suited to meteor detection and communication—amateurs can use 1000 watts and Villard, Manning, and Peterson used CW transmissions on 23.1 and 30.66 MHz in their tests. [11] Unfortunately, the 10-meter band is underutilized for meteor work. (See "Investigating Meteoric Radio Reflections on 10 Meters" accompanying this article.) You can miss a lot of meteors while no one is transmitting!

The distance between you and the station you hear depends on your receiver and antenna. Using a beam antenna on a high tower pointed at the horizon, you can expect to hear

TABLE 2: Meteor shower data

Meteor shower data for selected 1997 showers. Although emphasis is often placed on peak dates, many showers last for several days. The duration of a shower is defined as the period during which the activity is 1/4 peak or more. For these showers, detection should be attempted on several days. The directions listed in the Optimum Path columns indicate the directions from which signals can be received at your location. The times in these columns should be considered as broad guidelines only.

| Shower | Peak Date/ Time (Note 1) | Duration (days) | Optimum Path (Note 2) N-S | | | |
|-----------|--------------------------------|--------------------|---------------------------------|-----------|-------------------------------------|-----------|
| | | | | NW-SE | E-W | SW-NE |
| Orionids | Oct 22 1 h | 8 | 0000-0200 0600-0800 | 0430-0800 | 0330-0430 | 0200-0330 |
| S Taurids | Nov 3 1h | 30 | 2230-2330 0500-0600 | 0330-0430 | 0400-0530 | 2300-0100 |
| N Taurids | Nov 13 0h | 30 | 2300-0030 0530-0700 | 0500-0630 | - | 2330-0030 |
| Leonids | Nov 17 11h | 4 | 2200-2330 0500-0630 | 0430-0530 | - | 2300-0000 |
| Geminids | Dec 14 6h | 3 | 2000-2200 0330-0530 | 2130-2300 | - | 0500-0630 |
| Ursids | Dec 22 12h | 2 | - | 1830-2030 | 1900-2330 0130-0900 1600-1830 | 0500-0700 |

Note 1 - Peak dates in Table 2 are given as UT to conform with standard astronomy practice and to match similar data from other sources.

Note 2 - Optimum times in Table 2 are given as local standard time to facilitate use of the table by listeners throughout North America.

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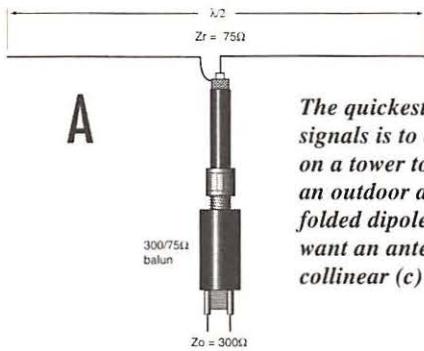
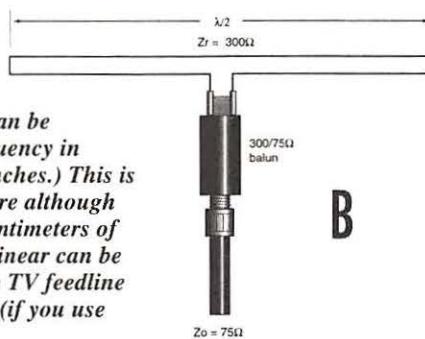


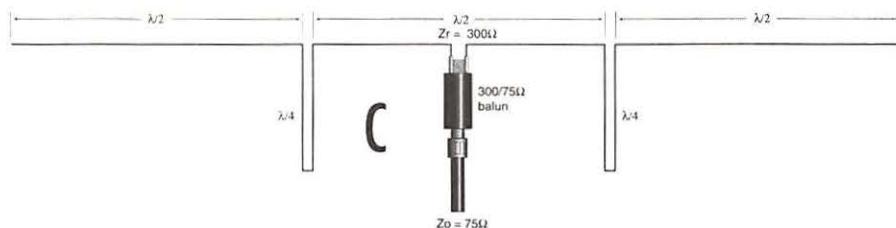
FIGURE 4

The quickest way to get set up to listen for meteor signals is to connect an outdoor FM or FM/TV beam on a tower to your receiver. For those who do not have an outdoor antenna, a simple, half-wave dipole (a) will bring in signals. For those who want an antenna with a little gain, the 3-element collinear (c) can be used.

In each case, the length $l/2$ in centimeters can be calculated using $14550/f$ where f is the frequency in MHz. (Use $5728/f$ if you prefer to work in inches.) This is based on the use of #14 solid or stranded wire although other sizes can be used. The length $l/4$ in centimeters of the two phasing stubs for the 3-element collinear can be calculated using $4950/f$ (if you use 300-ohm TV feedline with solid polyethylene dielectric) or $7125/f$ (if you use open-wire parallel line).



For inches, use $1949/f$ and $2805/f$ respectively. A 300/75-ohm balun as shown can be used to convert between 75-ohm antennas and 300-ohm receiver input or 300-ohm antennas and 75-ohm receiver input. If the antenna impedance (Z_r) and the receiver input (Z_o) match, you won't need the balun.



stations between 1300 and 2000 km (800 and 1250 mi.) away. An antenna which will receive signals from a higher angle of radiation (such as a half-wave dipole) will enable you to hear closer stations.

As Laurence Manning did in 1946, you can try listening for shortwave stations via meteor trail reflection. The station cannot be more than 2000 km away (and preferably it should be closer); however, it must be far enough away that you cannot receive any more than a weak groundwave signal. In addition, you must be listening at a time when normal F-layer propagation between you and the station is not a possibility. Since there would be no reason for a shortwave station to be on the air if F-layer propagation was not present, this dictates that you must be inside the skip zone. (Outside the skip zone, the station's signal will be so strong, it will mask any meteor signals.) If you try this approach, start with stations in the 13-meter band. Later, you can try stations on 16- and perhaps 19-meters.

Now, with all this talk of research at

Stanford University and scientists trying to determine the connection between meteors and shortwave communications, you might think that meteor detection is simply an academic pursuit—something that only researchers would be interested in.

Not so. There are practical applications that have made all this "time well spent" as they say on A&E.

There were military applications for communications via meteor trails until satellites came along. But there are other uses too. One company—Meteor Communications Corporation—uses meteor burst communications (MBC) in applications where very low data rate and waiting time do not present problems. By low data rate, they mean tens to hundreds of bits per second. Using this technique, the company can send data over links up to 1600 km (1000 mi.).

Applications include the remote sensing of meteorological and seismic conditions. One system monitors snowfall and accumulated snowfall.

MBC transmitters run 100 to 10000 watts into yagi or log periodic antennas. Although lower frequencies would produce longer echoes and higher amplitude echoes, frequencies in the 40-50 MHz range are used to avoid problems with multipathing and fading associated with the HF bands. While frequencies above 50 MHz have the advantage of smaller antenna size, these higher frequencies are subject to higher path loss.

In one system, a master transmitter sends out a continuous signal to the remote site. When a meteor trail appears, the remote site senses the reflected signal and it in turn transmits a burst of data.

Amateur radio operators have played a major role in meteor communications and many still attempt communications via meteors. In the past, amateurs used the 'message piecing' technique. That is, one station would repeatedly send a message and the receiving station would piece together the information until the contact could be confirmed. Recently however, amateurs have applied packet radio techniques to meteor communications.

A little practice with sporadic meteors and the Orionid meteor shower will prepare you for the possibility of a spectacular show during the Leonids over the next few years.

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Investigating Meteoric Radio Reflections on 10 Meters

One way to learn about meteor detection is to follow the lead of the pioneers and experts.

Some of the experiments are within the capabilities of beginners; others are not. The ones which are best left out are those which rely on radar techniques.

There are many "easy" techniques to investigate, however. This fall and winter, I will attempt several meteor activities with the assistance of Ontario DX Association members. You can try some on your own or help us with ours by listening for our signal and sending reports.

You can start by monitoring sporadic meteors. You can record the reflected signals on audio tape, strip chart paper, or your computer. You can then produce your own graphs of daily mean hourly rates of reflected signals. A variation of this is to produce a graph of average monthly median echoes per hour.

Similarly, you can select a meteor shower and determine the average hourly rate at which you detect meteors during the shower. This information can stand on its own or be compared to the daily mean hourly rate for sporadic meteors.

My planned activities include detecting meteor whistles. Using the amateur radio callsign VE3ACK, a CW signal will be transmitted on 29.050 MHz each Saturday and Sunday morning between 5 a.m. and 7 a.m. EST during October, November, and December. As with the experiment conducted by Villard, Manning, and Peterson at Stanford University, the output of the transmitter will feed a half-wave dipole. A similar dipole will be used at the receiver site several kilometers away. Although we will be listening for whistles, we will welcome reports from anyone who hears the signal.

We will also be transmitting during several meteor showers, including the Leonids in November. However, our major shower

activity will take place during the Geminids (December 13-15).

A possible meteor shower activity which we will undertake (and which you can attempt as well) is to set up two beam antennas (preferably narrow-beam antennas) pointing at the horizon. The antennas will differ in azimuth by 30°. As Earth rotates, a large number of echoes will first appear in Antenna 1 indicating the presence of a group of meteors (the shower). As Earth continues to rotate, activity in Antenna 1 will diminish and echoes will be heard in Antenna 2. The transfer of activity from Antenna 1 to Antenna 2 confirms the existence of the meteor stream. This method was used primarily for studies of major showers, such as the Perseids or the Geminids.

For updates on VE3ACK meteor activity, frequencies, and dates, visit the ODXA web site-<http://www.grove.net/~odxa/>

AN ASTRONOMY PRIMER

The following list of astronomy terms will explain the terms used in this article as well as terms related to meteors that you will encounter in astronomy books and articles.

Declination: just as you can locate any point on Earth by specifying its longitude and latitude, you can locate a star (or in the case of meteor showers, a radiant) by specifying the right ascension and declination on the celestial sphere. Right ascension is given in hours and minutes; declination is given in degrees. For example, for the Leonid meteor show, the right ascension (a) is 10h 11m and the declination (d) is +22°.

Duration: most meteor showers last for several days. The duration is the period during which the meteor rate is 1/4 or more of the rate at the peak date and time.

Meteor: the streak of light (and related phenomena such as ionization) produced when a meteoroid enters Earth's atmosphere

Meteoroid: an interplanetary particle which may be as small as 10-13 g or as large as 104 g. When a meteoroid enters Earth's atmosphere, it ablates at 120-60 km above Earth and produces a meteor.

Meteor stream: a group of meteoroids traveling in highly correlated orbits (parallel paths)

Meteor shower: the increased meteor rate which occurs when Earth intersects a meteor stream

Peak date and time: the date and time (in UT) at which the meteor rate will be maximum. Note that in astronomy, the time scale used is UT not UTC. They are closely related however, so don't fret about resetting your clock depending on whether you are listening to the BBC World Service or listening to meteors.

Planisphere: a chart of the sky showing the location of stars and constellations. The chart has a clear, plastic overlay which turns so you can set the date and time to get a view of the sky as it appears at that time.

Radiant: due to perspective, the parallel paths of meteors during a shower appear to meet at a point in the sky called the radiant. (The effect is similar to parallel railway tracks that appear to meet in the distance.) The meteor shower is usually named for the constellation in which the radiant is located. For example, the Leonids' radiant is in the constellation Leo; the Perseids' radiant is in the constellation Perseus.

Right ascension: see Declination above

Sporadic meteor: a meteor produced by a random meteoroid traveling through space on its own

E MERGENCY MEDICAL SERVICES



Story and photos by Ed Muro

Transforming Health Care One Life at a Time



The Star of Life was registered in 1977 by NHTSA. Each of the six "points" of the star represents an aspect of the EMS System: detection, reporting, response, on scene care, care in transit, and transfer to definitive care. The staff represents medicine and healing.

As the piercing sounds of sirens wail in the air everyone within earshot knows someone is in need of dire assistance. With today's EMS system in place, we can be assured help is on the way. That help—often volunteer help—saves lives. Its availability depends on full community support.

The Emergency Medical Services System is the newest profession in the public safety family which includes fire protection services and the police department. This vital community service receives around 15 million calls each year for emergency medical aid. It has been said that the average American will have to summon the Emergency Medical Service twice in their lifetime.

Until the mid-sixties, ambulances were little more than fast moving meat wagons. They afforded very little medical care and only promised rapid transit to a hospital. The only requirement for the job was to be able to drive well at high speeds and to be strong enough to lift the stretcher.

However, advances in medical technology—much of it pioneered during the Vietnam conflict—led to great changes in how patients were transported to hospitals. These gains made it possible to deliver more care at the scene of an emergency and on the way to the hospital. It also created the need for more highly trained personnel to operate a cohesive system.

■ National Standards are Set

Recognizing this, the Congress directed the U.S. Department of Transportation to establish national EMS standards. In 1966, the National Highway Safety Act was enacted, which included funds and standards for the EMS system. The resulting curriculum of instruction and clinical experience, now averaging about 110 hours nationwide, has become the principle model for the basic training of Emergency Medical Technicians (EMTs).

Noting that EMS is an entirely new service in the civilian structure of this nation, the National Highway Traffic Safety Administration declared that it was imperative that EMS be distinctly identified for the benefit of not only those working in the service but also the general public. Thus, in 1973 the "Star of Life" became the officially recognized insignia of EMS personnel and equipment on a national basis.

Although often the first to arrive at the scene of an emergency, EMTs sometimes find that emergency care has already been started by a first responder, such as a fire fighter, police officer, or other official trained in CPR, First Aid, and other basic life support techniques. Last year the New York City Fire Department implemented its own first responder program by training members from several engine companies as EMTs, in order to supplement the city's ability to provide timely care.

■ Standard Procedure

On the scene, responsibility for a victim is assigned to the EMT with the highest certification. In New York State there are several levels and they are basically the same in other states.

LEVELS OF CERTIFICATION

- EMT: Emergency Medical Technician: Includes basic Life Support Skills and the ability to extract victims from vehicles.
- AMT (Or A-EMT): not really used anymore, it means Advanced EMT; may or may not be a paramedic.
- EMT-CC: EMT-Critical Care: that's the new name for AMT, at least in N.Y. State.
- EMT-P: EMT-Paramedic, self explanatory

An EMT does BLS, or Basic Life Support. That's basically making sure that the "ABCs" are covered Airway, Breathing & Circulation. This is done with mouth to mouth (rarely now), CPR, bandages, splints, and oxygen.

An EMT-CC or EMT-P does both BLS and ALS (advanced life support). Advanced life support includes intravenous lines (IVs), Endotracheal tubes (ETs), administering medication by IV or injection, EKG cardiac monitoring, etc.

■ Critical Communications

The EMS system is more than the sum of the individual technicians and their equipment. It involves the systematic and carefully coordinated application of resources to provide failsafe, comprehensive medical care prior to hospital treatment. Emergency Medical Technicians must work in close coordination with firefighters, police, hospital personnel, life guards, and radio dispatchers to provide an effective response in all contingencies, whether it is the sudden illness of a single individual or a disaster affecting hundreds of people (MCI - Mass Casualty Incident).

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MONITORING TIMES

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the fire department or police department, but it, too, carries life and death significance. The Emergency Medical Service has become the third leg of the triad of Police, Fire, and EMS services. It is an indispensable service to the security of all U.S. residents.

While there are many frequencies used to dispatch life support services around the country (refer to your favorite local frequency directory for the frequencies in use in your area), once on their way with a patient in transit to the hospital many ambulances use **standardized national frequencies** set aside for biomedical telemetry. Commonly referred to as Med-1 through Med-8, the frequencies are:

Used on a nationwide basis:

| Ch: | Base: | Mobile: |
|-------|---------|---------|
| Med-1 | 463.00 | 468.00 |
| Med-2 | 463.025 | 468.025 |
| Med-3 | 463.050 | 468.050 |
| Med-4 | 463.075 | 468.075 |
| Med-5 | 463.100 | 468.100 |
| Med-6 | 463.125 | 468.125 |
| Med-7 | 463.150 | 468.150 |
| Med-8 | 463.175 | 468.175 |

Popular EMS dispatch frequencies used in the New York Metro Area Nassau County, New York:

| | |
|-----------------------------------|---|
| Fire Department Ambulances: | 46.100 (Countywide Dispatch: FireCom) |
| Volunteer Ambulance Corps : | 154.115 (Atlantic Beach, Malverne, Mineola, Wantagh-Levittown Ambulance Dispatch) |
| Bellmore-Merrick Ambulance | 37.94 |
| Garden City Ambulance | 155.340 |
| Emergency Ambulance Service Corp. | 463.300 |
| Five Counties Ambulance Service | 47.54 |
| TransCare Ambulance | 935.0125-939.9875 (trunked system) |
| Med-Com* (Medical Control) | 462.975 |
| Police Ambulances | are dispatched on local police precinct frequencies |

* Both Police Ambulances and Volunteer Ambulances notify Med-Com of the patients vital signs when in transit to the hospital. They also inform Med-Com of what hospital they are transporting to. Med-Com then notifies the appropriate hospital of the incoming patient. Med-Com's HQ is located at the Nassau County Medical Center (NCMC), where there is staff on hand to instruct the paramedics on what procedures to take should it be necessary. However, even though the headquarters is located at NCMC, not all patients are transported to that facility.

Suffolk County, New York:

| | |
|--------------|--|
| 155.235 | Commack Volunteer Ambulance Corps |
| 155.280 | Med-Com (County EMS Dispatch) |
| 155.325 | M.C.I. |
| 155.400 | Central Islip V.A.C. |
| 155.175 | Huntington Community F.A.S./ B.S.B.R.W VAC |
| Other Freqs: | 154.325, 154.385, & 154.415 |

Putnam County EMS Services:

154.815 MHz



As EMS becomes an increasingly important part of our medical system, so has interest in its communications increased. Volunteers, first-responders, shut-ins, off-duty personnel and an ever-growing number of private citizens regularly tune in local EMS radio traffic.

New York City:

NYC is composed of 5 counties called boroughs, dispatched individually.

New York City Fire Dept Division of Emergency Medical Services:

| | |
|--------------------------------|------------------------|
| Citywide | 478.4120 |
| Brooklyn South & Staten Island | 854.987 (Conventional) |
| Brooklyn Central | 477.862 |
| Brooklyn North | 478.262 |
| Queens | 478.262 |
| Bronx North | 478.212 |
| Bronx South | 477.837 |
| Manhattan South | 860.737 (Conventional) |
| Manhattan North | 855.487 |
| Manhattan Central | 856-860.987 (Trunked) |



SHOR T WAVE SATELLITES CYBERSPACE

By George Wood

Satellites have completely changed international broadcasting. That much is uncontroversial. Whether the change has been for the better depends on who you are. I have a feeling lot of shortwave listeners and hardcore DXers are not terribly pleased about how satellites have changed their hobby over the past ten years or so. Certainly when "Sweden Calling DXers" turned into "MediaScan" and shifted its focus from shortwave to satellites, there were a lot of letters denouncing the change.

But for a broadcaster, satellites are wonderful.

For years we've struggled with sunspots and the ionosphere, shifting frequencies to follow the illusive whims of propagation or to avoid accidental or intentional interference. Now, not only can our programs appear on listeners' receivers in perfect FM quality, but thanks to satellites, they are also reaching far more listeners directly or via rebroadcasts from local radio stations and cable systems.

We can also turn off some of those huge 500 kilowatt shortwave transmitters that have been consuming massive amounts of electricity, and rely instead on much lower-powered uplinks and solar-powered space downlinks.

For the sake of the planet's resources, satellites are wonderful.

With so many shortwave broadcasters moving to satellites, the overcrowded shortwave spectrum is opening up, making it

possible to hear the more exotic stations that used to be under the interference before. After all, most DXers don't seem to care much about listening to "easy" European broadcasters, they hunt for the rare signals from little transmitters in the tropics.

However, even the "easy" stations have a few programs of interest. One of the first applications of satellites to international broadcasting was to provide direct links to relay stations. That meant that Radio Netherlands could broadcast live from its studios in Hilversum, rather than send tapes for rebroadcast three weeks later. *DX Jukebox* became *Media Network*, with up-to-the-minute news about unusual new stations or shifting propagation. Similar programs like Glenn Hauser's *World of Radio* or the VOA's *Communications*

World suddenly became accessible in Europe and other locations where shortwave reception had been difficult. There's also a whole new hobby hunting satellite DX and on-the-spot news feeds.

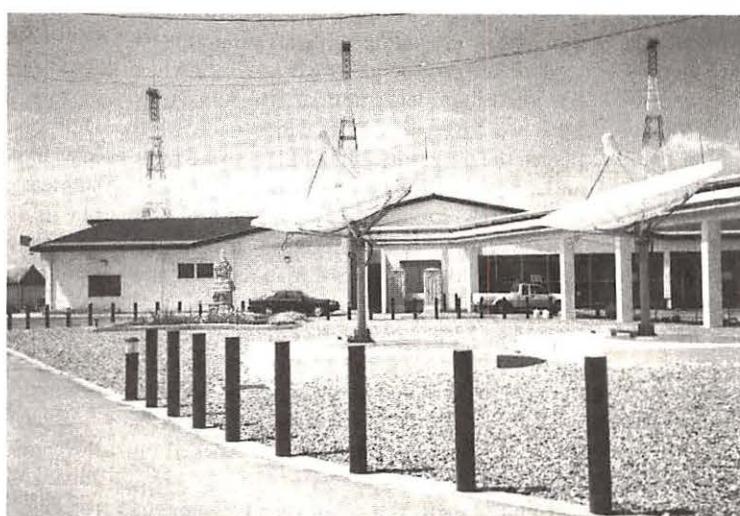
For DXers, satellites are wonderful.

■ The End of the Cold War & the Beginning of the Satellite Era

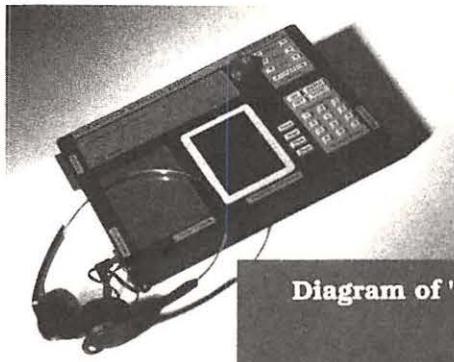
Aside from feeds to relay stations by major broadcasters like the BBC World Service, VOA, Deutsche Welle, and Radio Netherlands, the real impact of satellites on international broadcasting came in Europe at about the same time the Cold War was ending, in the early 90's. With the launch first of satellites from Eutelsat, followed by the first Astra

satellites, several radio signals could ride along on each TV transponder. Suddenly there was a relatively inexpensive way to reach all of Europe with an FM quality signal. For European shortwave broadcasters this seemed too good to be true.

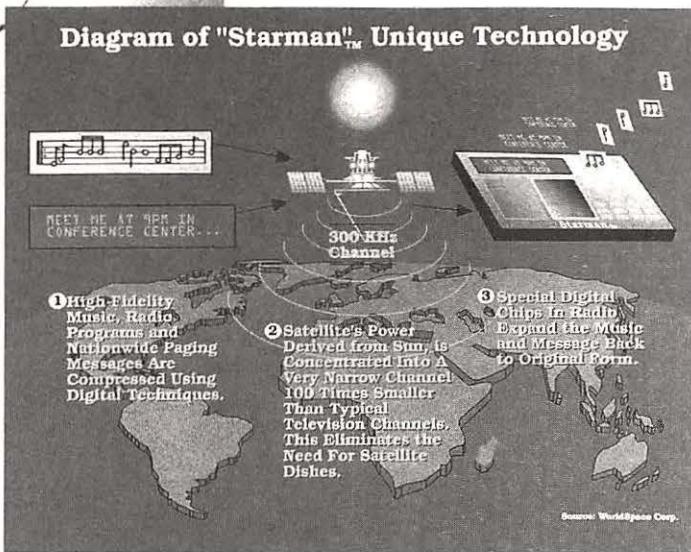
In a way it was. It turned out that there were a number of problems. For one thing, the audience was different. Shortwave listeners are a hobbyist community, and shortwave programming was designed for them, cozy, not terribly slick, and put together with potential poor conditions, interference, and fading in mind. Satellite listeners were perceived, in con-



Although the BBC is deeply interested in alternative methods of delivery, it remains committed to shortwave broadcasting. Shown is the BBC's Asia relay station in Thailand.



The new "Starman" technology utilizes compressed digital signals and a special digital radio to expand the music and message back to its original form.



trust, to be "normal" people, not hobbyists. Radio Sweden's management decided that the satellite program format had to sound more like domestic radio, and suddenly we were ordered to produce extra satellite shows in a new format, with the same staff resources, or less.

Less...that was the other repercussion of the end of the Cold War. Military budgets were slashed, but it also turned out that shortwave radio was considered by some politicians to be an obsolete remnant of the struggle between East and West, whose purpose had gone the way of the Berlin Wall. Across Europe and North America, funds for international broadcasting were cut back. Since satellite transponder rental was cheaper than the electricity burned up by half a megawatt shortwave transmitters, one way a station could reduce costs was to switch to satellite delivery.

Radio Finland is a good example of a small station that's gotten heavily involved in satellites, yet still relies on shortwave. But Managing Director Juhani Niinistoe says he's not about to give up shortwave completely:

"The two forms of delivery complement each other. Satellite reception is for fixed location listening only, while shortwave offers mobility. The individual tourist will carry a portable SW for immediate news service, but may also enjoy hi-fi radio in his or her hotel, delivered by satellite."

At Radio Sweden separate programming

for the satellite audience didn't work out. Partly it was a matter of resources, as you just couldn't do twice as much radio with fewer people. But it also turned out that the satellite audience was not as "normal" as management

sored news and entertainment from abroad. In the early days it was easy for stations like the Voice of America, Radio Free Europe, or the BBC—which had been regarded as friends during the decades of repression—to acquire local transmitters in the former Warsaw Pact countries. Satellites made relays from home countries possible. But this brief era had to end.

As the new democracies rediscovered and rebuilt their journalistic traditions, there was more interest in their own stations, and less in listening to outsiders, no matter how important those voices had been during the years of darkness. The disappearance earlier this year of VOA Europe, which had mixed American rock with news and features from Washington, marked the end of that era.

North America was hard to get into as well. There was the NPR satellite system, of course. If you could get your signal across the Atlantic (which was still expensive in the days before ISDN), you could pay NPR to put your programs on the satellite. But there was no guarantee at all that the local affiliates, faced with 16 channels of audio from NPR, American Public Radio (now PRI), and numerous independent producers, would run the material from abroad. A number of stations bought time anyway. Others booked ordinary audio channels on regular TV transponders and hoped some of the 1 or 2 million TVRO fans would listen in.

Then there was cable. Cable systems were already well established in North America, and were opening up across Europe, in connection with the satellite explosion that brought in so many new TV stations from around the world. Most cable networks carry radio, although that side of the operation is not always well-developed in Europe.

The problem was that only the major broadcasters like the BBC, Radio France, and Deutsche Welle could afford 24 hour services in a single language. Smaller stations leased a single sound channel to carry their entire output in a variety of languages. But no cable system was likely to relay a channel that switched every half hour from English to French to German to Russian, etc. A cable network in Britain would want a 24 hour channel in English, just as the Paris cable system would only be interested in relaying a 24 channel in French.

Even direct satellite listeners may object to the multi-lingual approach. Radio Finland's Juhani Niinistoe comments: "I have a letter on my desk from a Finnish professor demanding an explanation for why we air French on our Eutelsat channel...I will try to explain it to him."

Swiss Radio International took the ambitious route. It was easy to set up 24 hour satellite channels in the country's national languages, German, French, and Italian. But SRI expanded its English programming as well into a 24 hour operation.

Most smaller stations couldn't afford that kind of expansion. The solution, best expressed by Uwe Schoop, then head of the Swedish service at Deutschlandfunk, who called it "time-sharing," was for stations to get together to put all their programs in a single language on one satellite sound channel. The idea was obvious; the only problem was doing it, considering the nature of European public broadcasting. Large media bureaucracies just couldn't work together that way.

The "Gang of Four" of Radio Netherlands, Radio Sweden, Radio Canada International, and Swiss Radio International discussed the idea, but couldn't agree on its implementation. The European Broadcasting Union belatedly set up a special forum for international broadcasters, which also talked about the concept, but couldn't make anything happen either.

Who would run the system? Who would decide who got to broadcast in prime time? How would be costs be divided up? Who would pay for lines to the uplink site? There were lots of questions, and no experience in actually working together on that level.

■ WRN Runs With the Ball

In the end, three defectors from the BBC made it happen. Karl Miosga, Jeff Cohen, and Tim Ashburner kept their day jobs while they talked to stations about their World Radio Network. They got UPI to provide temporary facilities by doing some work for them, and talked British Sky Broadcasting into providing a free sound channel as a test. For a week stations from all over Europe, and as far away as Israel and India, shared a common satellite channel. The signals poured into a tiny room at UPI's headquarters in London's Docklands by satellite link, expensive broadcast circuits, ISDN, and even off shortwave.

It looked like chaos with cables running everywhere into equipment just patched together for the week, but it worked. Some weeks later, supported by a contract from National Public Radio to bring its programs to Europe, WRN Network One went on the air on Astra, relaying some 20 international broadcasters. Separate deals to relay Vatican Radio and Radio Canada International/CBC to Europe followed. Then WRN turned towards North America, and began relaying its European broadcasters on the WTBS transponder

on Galaxy 5. That was followed by a second channel, WRN 2, which turned things inside out by carrying programs in various stations' native languages for their nationals in North America.

C-SPAN has relayed international broadcasters on its Secondary Audio Programs for several years: one channel for the BBC World Service, another for a variety of stations, most of which have been available in North America via some satellite relay. Recently, several

hours a day of that service has relied on WRN 1.

One of WRN's biggest successes was talking Canada's CBC, beset by budget cutbacks, into taking the WRN 1 service to provide all-night programming on one of its national AM networks. Suddenly international broadcasters really were being heard by "normal" people, that is, normal insomniacs and normal night shift workers. (This has had interesting repercussions. One way Radio Sweden has dealt

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with budget cutbacks has been to regularly recycle various interviews and reports. That's worked on shortwave, where few people seem to listen to every broadcast. But numerous complaints about the repeats have come in from the Canadian night owls.)

More recently, WRN has expanded to Africa and Asia. The African service is on Intelsat 707, and is then relayed on the Multichoice DBS package on PAS-4. A deal similar to that with CBC Overnight has been worked out, and WRN 1 programs are carried in the middle of night across South Africa on a national network called SAfm.

The Asian service is part of a package of European radio broadcasters on Asiasat-2. Both the African and Asian relays differ from those to Europe and North America in that they are digital. That means right now the average home listener can't tune in. Instead they are intended for local and cable rebroadcasts.

I've devoted a lot of space to the World Radio Network story, because WRN is probably the most important tool for smaller international broadcasters to reach listeners on satellite. There's simply nothing better right now. The larger broadcasters, of course, have their own 24 hour channels. NPR was so pleased with its response in Europe that it leased its own channel, America One, together with PRI. However, both continue to provide programming on WRN as well.

■ The New Generation Broadcasters

The international radio broadcasters currently on satellite have all started with shortwave. But the coming digital age in broadcasting will see new stations that have never used any other medium. Europe is just introducing Digital Audio Broadcasting. The first regular transmissions began in September 1995 in Britain and Sweden. Canada, Denmark, Norway, Finland, Germany, France, and Belgium have all followed suit, and DAB is also testing or planned in the rest of Western Europe, India, Australia, and Russia.

European services are not expected to take off until the first consumer receivers arrive on the market this fall. Ultimately, DAB receivers will pick up transmissions from both terrestrial and satellite transmitters. In preparation for this, the BBC World Service, Deutsche Welle, Radio Netherlands, and Radio France International have, together with a number of smaller stations, organized EuroDAB. Right now the co-operation involves a number of weekly programs called Radio E carried on satellite and shortwave by the stations involved. The intention is to provide WRN-type

services in English, German, and French that would run on DAB channels in each of the participating countries, as well as via satellite.

This goal seems rather remote, as DAB spectrum will be limited until the FM band is phased out after the turn of the century: most countries will be filling their current DAB allocations with their own stations and are unlikely to make room for Radio E. While DAB transmissions are possible from Astra and Eutelsat, a proper service that could seamlessly fit in with terrestrial DAB and portable receivers will have to wait for low-orbit digital satellites.

Following the time-honored "Not Invented Here" philosophy the National Association of Broadcasters has rejected DAB in the U.S. in favor of an alternative system combining FM and digital signals. Meanwhile, the FCC has granted licenses to Satellite CD Radio and American Mobile Radio Corp for digital satellite radio services to the US. This DARS (Digital Audio Radio Service) will use spectrum above 2310 MHz for broadcasts from low orbit satellites. So Europe and America will be fighting out the NTSC/PAL wars once again, over digital radio, with receivers of limited geographic functionality.

One new digital international radio project is definitely moving forward. WorldSpace was founded by Noah Samara in 1990, and has its headquarters in Washington, DC. The plan is to launch three geostationary satellites which will provide programming specifically to Third World countries: AfriStar to Africa and the Middle East, AsiaStar to Asia, and AmeriStar to Latin America and the Caribbean. Each will provide 100 digital audio channels to the entire coverage area.

The first satellite to be launched will be AfriStar in June 1998 on Ariane. It will be followed at six month intervals by AsiaStar and AmeriStar. All three are being made by Alacatel Espace of France. Broadcasters who have signed up so far include some familiar names to the shortwave and tropical band DX community, such as the Voice of America, Radio Netherlands, Colombia's Radio Cadena Nacional, the Ghana Broadcasting Corporation, and Kenya Radio and TV, along with Korea's New World Sky Media, and Nigeria's Ray Power 100 FM.

The plan depends on the development of affordable receivers. By using economies of scale, the goal is to produce new satellite receivers costing between \$20 and \$30. These would be truly portable, with antennas the size of credit cards.

WorldSpace and similar projects may be a threat to traditional tropical band DXing. Some of those exotic stations may disappear from

the shortwave bands if local listeners can tune into one hundred stations on cheap portable receivers. On the other hand, some of the exotic stations may become accessible for listeners over an entire continent, or even a hemisphere. (Some interesting DX prospects here?)

■ From Satellites to Cyberspace

The digital age could open up the planet for thousands more radio stations over the Internet. When Radio Sweden (and *Sweden Calling DXers*) changed focus from shortwave to satellites, SCDX founder Arne Skoog was very skeptical. Arne was sure satellites would never replace shortwave, and pointed to the cost and size of receiving equipment, and the lack of portability as the main reason.

I always thought Arne was forgetting the history he had been a part of. In Britain the simplest Astra dishes and receiver packages sell for under £100 (around \$150 dollars). That's cheaper than almost any decent shortwave receiver. Even in Scandinavia, where a satellite package may cost 5000 kronor (around \$800), that's still less than a quality professional DX machine.

Satellite receivers admittedly aren't very portable. But until very recently shortwave receivers weren't portable either; they were boxes at least as large as a modern satellite receiver, and just as firmly connected to antennas as the connection to the satellite dish. But this is about to change. The upcoming generations of DAB and WorldSpace receivers will be just as portable as any current pocket Sony shortwave model.

But then there's the Internet. Soundfiles have been available over the World Wide Web since its inception, but the drawback was the long time required to access the file—perhaps ten minutes of download for every minute of audio. That changed in April 1994, when Seattle's Progressive Networks introduced RealAudio, which allows an audio file to be played while it downloads, more or less instantly. Since then RealAudio has progressed to versions 2.0 and 3.0, and the Real (Video) player and competing systems like Streamworks have appeared, providing both audio-on-demand and live broadcasts. Right now there are hundreds of radio stations around the world you can listen to on the Internet, including many international broadcasters and the entire World Radio Network output. See p. 56 for our exclusive WRN 1 schedule on Internet compiled by Jim Frimmel.

For a small station like Radio Sweden this is wonderful. Swedes and interested non-Swedes anywhere in the world can access programs whenever they want, from wher-

ever they are. The quality initially sounded worse than AM radio, and RealAudio 3.0 doesn't always live up to its claim of sounding like FM. But what does that matter to an international broadcaster? It's still better than shortwave, and high-speed permanent Internet access and a RealAudio server cost a lot less than a 500 kilowatt transmitter.

Juhani Niinistoe of Radio Finland says the Internet has some definite advantages over satellite distribution: "In parts of Africa the Internet is very popular due to the large size of the dish required for our Intelsat relay there, and due to the short length of our shortwave transmissions."

Oddly, while Arne Skoog is critical of satellite radio, he approves of radio on the Internet. This may have something to do with his granddaughter in Australia being able to listen to Swedish Radio on her desktop computer. But that's as good as reason as any.

So far, though, the portability is missing. I wrote an article about Internet Radio for the 1995 *World Radio TV Handbook* in which I fantasized cutting off the modem connection to the computer and somehow transmitting all the Internet bandwidth into the air. It was

a vision that betrayed a less than perfect understanding of the way the Internet works.

Where an analog cable TV network has to provide bandwidth for all of its TV and radio channels, an interactive digital network essentially only has to provide one signal at any given moment. You can have access to thousands of radio stations out there on the Net, but generally you only ask for one at a time, and then receive just one at a time over your existing bandwidth.

Right now you can take a laptop computer and access the Internet over a digital GSM telephone in most of Europe, as well as parts of Africa, the Middle East, and Asia. So you can tune into a RealAudio radio station. The only problem is that, currently, GSM works at 9600 bps and RealAudio really requires 28.8 kbps or better, and the signal tends to break up a lot at slower speeds. GSM calls are also very expensive, so mobile listening to radio on the Internet can be pretty costly.

GSM manufacturers are working to improve the speed for digital access, and perhaps the cost of the calls will come down, but there are other solutions as well. In some American cities there is wireless Internet

service from Ricochet and other companies, at speeds and costs about the same as ordinary Internet Service Providers. With such a connection you can listen to Web radio on a laptop anywhere in the coverage area. (Finally a use for Newtons and other PDAs?)

Better still, after the turn of the century the planned Internet access from low orbit satellite networks like Iridium and Teledesic will make Internet Radio as portable as modern FM. This is where things can get a bit mixed up, as DAB, terrestrial or satellite, also carries images and text information using the standard HTML code used on the World Wide Web.

Is listening to a Teledesic relay of a RealAudio streaming audio program or accessing a DAB-station's Web page via Iridium *satellite radio* or *cyberspace radio*? Or will there be a difference?

Hopefully even in that networked future there will still be a few tropical radio stations for the DXers to chase. But (assuming the politicians and bureaucrats can work out the royalties for global netcasts) the rest of us will be able to listen to virtually any radio station in the world, from anywhere in the world.

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The Name's the Thing

Three standards have emerged as the front runners in a continuing technological battle of wireless air interfaces. An alphabet soup of acronyms are being used to differentiate new services as proponents and foes of each standard form alliances to market their choice to the consumer.

Code Division Multiple Access (CDMA), Global System for Mobiles (GSM), and North American Digital Cellular (NADC) are all competing in the marketplace for acceptance in upgraded cellular and new PCS networks. No longer content to advertise pricing and features, major service providers are now using brand names to build consumer confidence and loyalty.

■ Code Division Multiple Access (IS-95)

Code Division Multiple Access is a method by which a number of callers share the same frequency at the same time but are kept separate by the use of pseudo-noise (PN), or spreading, codes. Using these codes, a receiver can "de-spread" the desired signal and recover a particular caller's data (see the February 1997 *PCS Front Line* column for an introduction to CDMA).

The current CDMA specification, termed IS-95, was originally developed by San Diego-based Qualcomm, Inc., and became an approved Telecommunications Industry Association (TIA) standard in July of 1993. Early CDMA systems were established in Hong Kong and Korea, but are now rapidly being built in the United States. Many existing cellular carriers are converting portions of their 800 MHz spectrum from analog to digital CDMA service, and according to the CDMA Development Group (CDG), an industry association of

IS-95 proponents, of the nearly 3,000 PCS licenses granted by the FCC, slightly more than half of the license holders have chosen CDMA, while GSM was selected by 28 percent and TDMA by 20 percent.

The CDG is also attempting to "brand" IS-95 networks under a single term — cdmaOne. This trademark is supposed to serve as a catch-all term for the family of wireless products using the IS-95 air interface, including cellular, PCS, and wireless local loop.

Major CDMA vendors Lucent Technologies, Motorola, Nortel, and Qualcomm are also working with CDG to develop specifications for a next-generation "wider-band" IS-95-based CDMA technology.

It should be noted that not all proposed CDMA networks follow the IS-95 standard. Ericsson and Nokia, two major European suppliers, are testing a "wideband CDMA" (W-CDMA) not related to IS-95. Optimized for such high speed data applications as Internet access, multimedia electronic mail, high quality voice, and even video, W-CDMA uses a CDMA air interface linked to a GSM network infrastructure.

In Japan, Nippon Telephone and Telegraph's DoCoMo is performing experimental field tests on both Ericsson's W-CDMA and an IS-95 follow-on developed by Lucent Technologies.

■ Global System for Mobiles

The Global System for Mobiles (GSM) is an international air interface and network standard that has been developed and refined over the past decade, primarily in Europe. Several North American GSM service providers have recently formed the GSM Alliance to jointly market digital wireless voice and data services on PCS frequencies (1,900 MHz) and will be working to provide uniform features, roaming rates, and other services across the country.

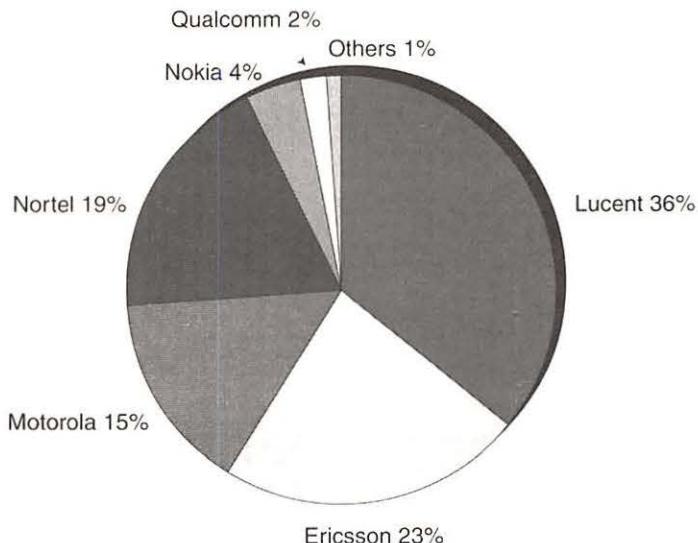
The GSM Alliance includes Aerial Communications, BellSouth Mobility DCS, Microcell Telecommunications, Inc. (Canada), Omnipoint Communications, Pacific Bell Mobile Services, Pocket Communications, Powertel, and Western Wireless. Microprocessor giant Intel is also supporting the alliance through its Mobile Data Initiative in an attempt to boost growth in the wireless data market.

The first commercial PCS network in the United States, American Personal Communications' Sprint Spectrum, uses the GSM standard and will be involved in the Alliance, but is also affiliated with Sprint, which has selected CDMA.

The use of GSM in North America has been limited to PCS frequencies in part because of its 200 kHz wide channels, which cannot be easily retrofitted into the 800 MHz cellular band allocation of 30 kHz wide channels.

GSM has also introduced the Subscriber Identity Module, or SIM, to U.S. consumers, containing security, identity, and other information. These programmable smart cards can be easily transferred from one wireless handset to another, allowing a subscriber to quickly change equipment while retaining the same access number and service features.

PCS Infrastructure Market Share



■ North American Digital Cellular

North American Digital Cellular (NADC) is based on IS-136, an enhancement of an older standard that makes use of Time Division Multiple Access (TDMA) techniques. NADC was originally slated to be the single digital standard for the United States prior to Qualcomm's IS-95 proposal, and has been in use for several years.

The largest proponent of NADC, AT&T Wireless, is using TDMA in both new PCS frequencies and upgraded analog cellular areas, creating some additional confusion by marketing their 800 MHz NADC service as "Digital PCS." Purists would claim PCS refers to services in the 1,900 MHz band, but AT&T counters that consumers are interested in features and capabilities, not operating frequencies.

■ Customer Acceptance

All three standards promise increased user capacity, improved sound quality, fewer dropped calls, and broader coverage area than the analog equivalent. The digital nature of the air interface also allows additional services, such as caller ID and paging, to be easily incorporated into the system.

At the end of June there were an estimated 646,000 GSM customers and 420,000 CDMA customers. In the near term, GSM operators appear to be growing quickly. For example, BellSouth Mobility DCS and Pacific Bell Mobile Services both claim more than 100,000 customers, while in seven and a half months Omnipoint has signed up 42,000 customers.

■ Wireless Infrastructure

Like the gold rush of the mid-1800's, the ones making the money are the equipment providers. PCS and cellular infrastructure revenue in 1996 reached \$5.3 billion, up from \$3 billion in 1995. PCS equipment alone went from \$530 million to \$2.8 billion during that period. Lucent Technologies led the pack with more than a third of the market, followed by Ericsson and Motorola. Nortel had nearly 20 percent of the market and was the only provider to win both CDMA and GSM contracts of significant size.

■ Cellular and GPS

The Global Positioning System (GPS), operated by the United States Department of Defense, is a constellation of 24 low earth orbit satellites which provide accurate position and time information to military and civilian users. GPS first gained fame during Operation Desert Storm by providing pinpoint accuracy for soldiers and guided munitions. Peacetime uses for accurate location information are now quite numerous, and even more will be found as GPS is combined with wireless communication networks.

Automobile manufacturers are incorporating GPS and cellular technology to provide security, safety, and peace of mind to their customers. The OnStar division of General Motors currently provides cellular communications units and service to more than 12,000 customers, and hopes to install as many as two million OnStar units in more than twenty of GM's 1998 models. At \$270 a year for unlimited service and \$900 for installation, the service is not cheap, but provides 24 hour monitoring and the ability to remotely lock and unlock doors as well as perform engine diagnostics. Lincoln offers their version, termed remote emergency satellite cellular unit (RESCU), in Continentals at a retail price of \$1995.

Consumer studies have shown that the primary reason for purchasing a cellular phone is safety, and adding accurate GPS location information to a distress call has clear value. Further advancements in these technologies include sending a cellular message if the air bag is deployed or a major mechanical malfunction occurs.

Smaller devices are also currently in development to provide personal security in a handheld package. When the user presses a panic button the internal GPS receiver sends current position information via a tiny cellular digital packet data (CDPD) modem to an operations center, which can then dispatch emergency services or assistance to the proper location.

That's all for this month. Keep that electronic mail coming to dan@decode.com, or check the PCS Front Line website at <http://www.grove.net/~dan>. Until next month, happy monitoring!

PCS LICENSE HOLDER SERVICE AREA STANDARD

AT&T Wireless Services, Inc.

AL, AR, AZ, CA, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MI, MN, MO, MS, NC, NE, NV, NY, OH, OK, PA, PR, SD, TN, TX, UT, VA, VT, WA, WI, WV, WYTDMA

NextWave Personal Communications Inc.

CA, CT, DC, DE, FL, GA, IL, IN, KY, MA, MD, ME, MI, MO, NH, NJ, NM, NV, NY, NC, OH, OK, PA, RI, SC, TX, UT, VA, WICDMA

Omnipoint Corp.

AL, AR, CO, DC, FL, GA, IA, IL, IN, KS, MA, MD, ME, MI, MO, NC, NH, NY, OH, OR, PA, PR, RI, TN, TX, VA, WV

GSMPacific Bell Mobile Services

CAGSM

Pocket Communications

AR, HI, IL, IN, KS, LA, MI, MO, NE, NV, OH, TXGSM

PrimeCo Personal Communications

LPAL, FL, HI, IL, LA, TX, VA, WICDMA

Sprint PCS

AK, AL, AR, AZ, CA, CO, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MI, MN, MO, MS, NC, NE, NM, NY, OH, OK, OR, PA, PR, SC, TN, TX, UT, VA, WA, WI, WV, VICDMA

Western Wireless Corp

AR, AZ, CA, CO, HI, IA, ID, IL, KS, MN, MO, MT, ND, NE, NM, OH, OK, OR, PA, SD, TX, UT, VA, WA, WIGSM

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Acts of Congress – Part II

Last month this editor heaped a good deal of criticism upon Congressman Ed Markey and his infamous bill HR 1964. I wrapped up that piece with the comment that Congressman Markey was an obviously intelligent man but perhaps had misunderstood the ramifications of the scanner-related section of his Act.

By August 13th I had become so concerned about the pending legislation, both Markey's and Billy Tauzin's, that I decided to make some calls and hopefully attain a better understanding of the situation. What suddenly hit me was the fact that my company is based in Congressman Markey's 7th district. So I decided to call my Congressman's office.

I had a long discussion with Colin Crowell, Congressman Markey's staff aide on telecommunications. Mr. Crowell spent nearly one hour on the phone with me and was most respectful and patient. He clarified a great many alleged misconceptions about the intent of the bill. Here's the gist of our conversation as I interpreted it. (An e-mail copy of these points was sent Mr. Crowell for his comments. Should he wish to make any corrections later, I will include them next month.):

1. Congressman Markey's bill is not likely to go anywhere. At present, it has no co-sponsors and is not under consideration for hearings.
2. The intent of the bill (HR 1964) is to extend the same privacy rights to CMRS (commercial mobile radio service) users, who may utilize telephone interconnect services, as the cellular users are afforded in the ECPA and its follow-on legislation (i.e. prohibition on monitoring cellular calls, and no scanners are to be manufactured with the cellular frequencies).
3. The FCC has "forbearance" in these situations and may provide exclusions from any frequency prohibitions. (I'm not totally clear on this provision, which needs further clarification.)
4. The Congressmen (Tauzin and Markey) are not interested in marching scanner or shortwave radio users lock-step off to prison or in putting scanner manufacturers out of business.
5. Mr. Crowell said that if an agency feels a great desire to have their communications monitored, it should have that right. (This statement does concern me. Perhaps I don't understand the exact meaning.)
6. I informed Mr. Crowell that scanners are used by volunteer firefighters, law enforcement (including every State Police cruiser in Massachusetts), emergency management and others. Mr. Crowell appreciated my argument that if only public servants were allowed to use scanners, and Uniden and Radio Shack lost the opportunity to sell to the general public, scanners would either no longer be produced or their cost would rise exponentially. Public safety would either lose the ability to purchase scanners or their cost to the taxpayer would be enormous.
7. The Congressman recognizes that there are thousands of NASCAR fans, for example, for whom this legislation could be crippling to their enjoyment of their \$200 or \$300 scanner investment. (This



Markey's staff insists it is not their intent to shut down the scanner industry.

is but an example. There are shortwave listeners, marine radio two-way users, the elderly and disabled who use scanners as a perfect hobby for the house bound, as well as general radio hobbyists who utilize their scanners in constructive and enjoyable ways—all of whom are in danger of losing their hobby if the bills pass as written.)

8. Most importantly, as Mr. Crowell states, these bills have been proposed to encourage discussions and hearings, so that the concerns of the public safety community, the hobbyist community, and others may be heard, and the language of the bill subsequently adjusted.
9. The crux of the issue may be that the FCC needs to rework so that public interconnect frequencies are not shared with public safety. These hearings may accelerate that process.
10. TV Channels 60-69 may be made available to public safety agencies shortly. As agencies migrate to this band, perhaps scanners would be permitted to include this range of dedicated police, fire, EMS, and local government frequencies as there would not then be a concern of public interconnect issues.

Mr. Crowell listened to all my arguments carefully and engaged in a useful debate over many of the points I outlined in last month's article.

While I told Mr. Crowell that I respect the desire to honorably consider and debate the benefits of offering privacy to public interconnect users, I could not understand how Congressman Markey would co-sponsor Mr. Tauzin's HR 2369. It's one thing to present a bill which has some problems, but which can be marked-up and amended during a hearing. It is quite another thing to propose or co-sponsor so draconian a measure as HR 2369. This bill takes 63 years of workable, sensible legislation (the Communications Act of 1934) and turns it inside out.

I want to reiterate, though, that after talking with Mr. Crowell and others in Congressman Markey's office, I was left most impressed. I was impressed with the eagerness which was shown in trying to understand and reconcile my position with the Congressman's. After this phone call I can only believe that Mr. Markey will do the right thing and enforce existing law, perhaps double the penalties for criminals making inappropriate use of a scanner, require that CMRS telephone interconnect providers offer more encryption options to

their customers, and the like. There are actions that can be taken which would offer complete security (rather than the illusion of security) to any two-way radio user who desires it, but at the same time maintain the rights of hobbyists as well as public servants to monitor the airwaves as they have done since the dawn of radio.

I applaud Congressman Markey's staff. I look forward to the day when I can applaud the Congressman himself for recognizing the faults in Billy Tauzin's broad-brush bill and taking action to set it straight.

■ Seattle Area Trunking

One of the most complex, but also one of the most interesting, trunked systems in the country is located in the Seattle/King County area of Washington state. According to FCC records, there are numerous trunked systems in the Seattle area, many of which operate off of more than one site (probably due to the hilly terrain which requires fill-in, zonal-type transmitters).

From 3000 miles away, we had heard stories that the agencies in the Seattle area which owned the trunking systems had been swapping around frequencies, trying to find the right combination for their respective areas. Uniden Trunktracker BC-235 customers had been reporting on TRUNKCOM, and through www.trunktracker.com e-mail contacts, that they were having difficulty figuring out which frequencies matched up with the appropriate data channels. With so many transmitter sites in the region, it was unclear what data channels fed which frequencies.

Your scanner editor just made a trip to Seattle to try to wade through the confusion and make sense of the area's systems. Using the new TrunkTrac™ software, as well as the BC-235, I was able to determine frequency plans and obtain a fairly good understanding of what's happening in the Sea-Tac (Seattle/Tacoma) region. I must also thank Rick Thompson, Dan Lawrence, and their friend Rich, as well as Steve Gardner, for their time and the fine work they're doing on understanding their local trunking networks.

What I learned is that the Seattle area system must be one of the most unique, and innovative, trunked networks in the nation. What has apparently happened in the Sea-Tac area is that numerous public safety agencies have pooled their resources to create, in effect, a single massive system, a Regional Emergency Communications System, making communications and inter-operability between agencies easy and efficient.

The Seattle region is growing rapidly. With Boeing, Microsoft, Starbucks, and other large companies populating the area, and thousands streaming out of California for the less hectic grind of the Northwest, Seattle is a popular place to be. And the eastern Puget Sound region is huge. From Bellevue and Redmond in the north and east, west to Seattle itself, and south to Renton, Kent, Sea-Tac (where the airport is located), and Auburn, there are thousands of square miles in this King County territory.

Originally, a number of individual trunked systems were destined to go online: Eastside Public Safety (EPSCA), King County (the King County sheriff, fire department and various county agencies), Valley Communications (Valley Comm), to cover incorporated communities within the county, the city of Seattle, and the Port of Seattle. While we are making some educated guesses about how these systems came to be, what we now believe to be the case is that there is one large regional Motorola Type II trunking system, which is actually split up into multiple zones somewhat in accordance with the original design. From what we understand, King County and Valley Comm have

merged, although they have separate dispatchers, and EPSCA and the city of Seattle, both maintain their own autonomy within the system (the Port of Seattle has its own separate system). However, units can apparently roam from one end of the county to another, and from one "zone" to another, without changing ID's.

This is what made it so difficult to previously understand how frequencies matched up with data channels. A Seattle police unit using talkgroup ID 3312 was heard on multiple frequencies and what appeared to be multiple systems. Actually, these group broadcasts, like so many others, are simulcast throughout many, if not all, zones within the larger system. (It may depend on whether there are units of group 3312, for example, within range of one of these zones as to whether its talkgroup is made available, and is simulcast, off that zone's frequencies.) Generally speaking, you could monitor the Seattle police department by trunk monitoring the city of Seattle, EPSCA or King County/Valley Comm's set of frequencies.

What makes this all so interesting is that you only need to figure one set of ID's for the entire system. A King County unit will not have the same ID as a city of Seattle unit, even though that K.C. unit may never roam into the Seattle zone. By monitoring only the EPSCA system, you'll likely hear city of Seattle police and fire department units, King County sheriff and fire communications, as well as the primary departments dispatched by EPSCA, such as Redmond, Bellevue and others in the northern county area.

Note: Again, this editor is making some assumptions based on monitoring. If you feel that portions of this article are incorrect, please write or send e-mail with your questions and comments. We are very interested in trying to determine exactly which agencies are dispatched out of EPSCA, King County, and Valley Comm. Also, it is our understanding that things are still in a state of flux as far as frequencies are concerned. You will note below that not all licensed frequencies appeared in use. We've been told that more frequencies will come online within the next 90 days. Finally, the city of Tacoma, some 20 miles to the south of Seattle, has its own trunking system licensed. We're not sure if it's tied in with the regional communications system or if it's even on the air.

What is perhaps most interesting of all regarding monitoring Seattle trunking is how open-minded the city is about it. Prior to the introduction of the BC-235 TrunkTracker, you could write the city and request to purchase a Motorola radio programmed with certain police and fire talkgroups. The city recognized that the public has a right to monitor and that the public can provide a valuable service by keeping informed. What is really most terrific about this enlightened city, is that you can now obtain selected "Bearcat" talkgroup ID numbers directly from the city's Executive Services Department! That's right, the city is even converting their radios' Hex code into decimal for BC-235 TrunkTracker users! I raise my cup of Java (yes, you can find a coffeehouse anywhere in Seattle) to this great city, and its great people, in the northwest.

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(continued)

REGIONAL EMERGENCY COMMUNICATIONS SYSTEM TALKGROUP ID'S

(Seattle, King County/Valley Comm, EPSCA, and possibly even Port of Seattle. Special thanks to Rick Thompson, Dan Lawrence, and their friend Rich, as well as Steve Gardner, and the participants in the Washington "Interceptor" web site for their assistance.)

Regional Emergency Communications System

| ID | Agency | ID | Agency |
|------|--|-------|---|
| 48 | Police at SeaTac Airport | 6864 | Seattle Event 4 (Citywide Event) |
| 80 | Harbor Patrol Police | 9072 | Health Department EOC |
| 1648 | Seattle Fire Department -1- | 9232 | Water Front PD? |
| 1680 | Seattle Fire Department -2- | 18416 | Redmond Police - Tactical/Car to car |
| 1712 | Seattle Fire Department -3- | 18544 | Redmond Police |
| 1744 | Seattle Fire Department -4- Dispatch | 18928 | Mercer Island Police |
| 1776 | Seattle Fire Department -5- EMS | 19472 | Kirkland Police |
| 1808 | Seattle Fire Department -6- EMS | 21232 | Bellevue Police - Car to car |
| 1840 | Seattle Fire Department -7- Tactical | 21360 | Bellevue Police - Records |
| 1872 | Seattle Fire Department -8- Tactical | 21424 | Bellevue Police - Primary Dispatch |
| 1904 | Seattle Fire Department -9- Tactical | 22192 | Eastside Fire - Tac 2 |
| 1936 | Seattle Fire Department -10- Tactical | 22224 | Eastside Fire - Tac 1 |
| 1968 | Seattle Fire Department -11- Ambulance | 22384 | Eastside Fire Dispatch (Bellevue & surrounding area) |
| 2000 | Seattle Fire Department -12A- MEDCOPM | 22416 | Radio Maintenance? |
| 2096 | Seattle Fire Department - Administration | 23152 | King County Police Department - North (460.325 Simulcast) |
| 3248 | Seattle Police Department -West- Dispatch | 23216 | King County Police Department - Southeast (460.450 simulcast) |
| 3280 | Seattle Police Department -North- Dispatch | 23248 | King County Police Department - Tac 3 |
| 3312 | Seattle Police Department -South- Dispatch | 23280 | King County Police Department - Southwest (460.400 simulcast) |
| 3344 | Seattle Police Department -East- Dispatch | 23472 | King County Police Department - Data (460.275 simulcast) |
| 3408 | Seattle Police Department -Data- | 23504 | King County Police Department - Tac 1 (460.500 simulcast) |
| 3440 | Seattle Police Department -Tac 1- | 3472 | Seattle Police Department - East Tac |
| 3472 | Seattle Police Department -Tac 2- | 3504 | Seattle Police Department -South Tac |
| 3504 | Seattle Police Department -Tac 3-? | 3536 | Seattle Police Department -North Tac |
| 3536 | Seattle Police Department -Tac 4-? | 3632 | Seattle Police Department -West Tac |
| 3632 | Seattle Fire Department -East Tac- | 3664 | Seattle Fire Department -South Tac |
| 3664 | Seattle Fire Department -North Tac- | 3696 | Seattle Fire Department -North Tac- |
| 3696 | Seattle Fire Department -South Tac- | 3728 | Seattle Fire Department -West Tac- |
| 3728 | Seattle Fire Department -South Tac- | 3952 | Seattle Police Department -Harbor Patrol |
| 3952 | Seattle Police Department -Data- | 3984 | Seattle Police Department -Tac 1 |
| 3984 | Seattle Police Department -Tac 2- | 4048 | Seattle Police Department -Tac 2 |
| 4048 | Seattle Police Department -Tac 3-? | 4240 | Seattle Police Department -Tac 3? |
| 4240 | Seattle Police Department -Tac 4-? | 4912 | Key Arena |
| 4912 | Seattle Police Department -Data- | 4944 | Key Arena |
| 4944 | Seattle Police Department -Tac 1- | 5168 | Seattle Center |
| 5168 | Seattle Police Department -Tac 2- | 5520 | Seattle - Woodland Park Zoo |
| 5520 | Seattle Police Department -Tac 3-? | 5552 | King County Animal Control |
| 5552 | Seattle Police Department -Tac 4-? | 6480 | Seattle Water & Sewer |
| 6480 | Seattle Event 1 (Citywide Event) | 6768 | Seattle Event 2 (Citywide Event) |
| 6768 | Seattle Event 3 (Citywide Event) | 6800 | Seattle Event 4 (Citywide Event) |
| 6800 | Seattle Event 5 (Citywide Event) | 6832 | Seattle Event 6 (Citywide Event) |

FREQUENCIES BY SYSTEM ZONES

(Frequencies marked with a * are licensed to the system but were not active during our test using TrunkTrac software. They may either be scheduled for future use or simply these repeaters may have been down for repair.)

City of Seattle (Columbia Tower Site) - Primary Sites

| | | |
|-----------|-----------|---------------|
| 851.1875* | 854.3625 | 866.8875* |
| 851.4125* | 866.2875 | 867.2875 |
| 851.9375 | 866.3125* | 867.7625* |
| 851.9875 | 866.3375 | 867.7875 |
| 852.1625* | 866.4375* | 868.1750 Data |
| 852.6875 | 866.6875 | 868.4750 |
| 852.9125 | 866.7125 | 868.6750* |
| 853.4375 | 866.7375* | 868.8750 |
| 854.1875 | | |

Seattle Fill-in Coverage Sites (not monitored or known if on-the-air)

| City of Seattle - Apple Cove Site | 866.1625 | 868.2250 | City of Seattle - North Metro Site | 859.2375 | 860.2375 |
|-----------------------------------|----------|----------|------------------------------------|----------|----------|
| | 866.4125 | 868.6500 | | 859.4875 | 860.4875 |
| | 866.6625 | 868.9000 | | | |

(Note: As long as you can receive the primary system there is no need to monitor the fill-in sites as all communications broadcast on the fill-ins are likely simulcast off of Columbia Tower.)

Eastside Public Safety Communications Authority (EPSCA)

| | | | | |
|-----------|-----------|-----------|-----------|---------------|
| 851.1375* | 854.2375 | 866.9125 | 867.4875 | 868.5250* |
| 851.8875 | 866.2125* | 866.8875* | 867.8125 | 868.7750 Data |
| 852.6375 | 866.2375 | 866.9875 | 867.8875* | 868.8250* |
| 853.3875 | 866.4625 | 867.3125 | 868.2000* | |

Eastside Public Safety North Seattle Fill-in Site

| | | |
|----------|----------|----------|
| 867.2250 | 867.3625 | 868.9500 |
| 867.2500 | 867.3875 | 868.9750 |

Eastside Public Safety Mobile Data Terminals (used systemwide?)

852.7125

King County/Valley Communications

Primary Site (?) Not monitored

| | | | | |
|----------|----------|----------|----------|----------|
| 851.0625 | 851.9625 | 853.4875 | 866.3875 | 867.8375 |
| 851.0875 | 852.1125 | 853.6125 | 866.9375 | 867.8625 |
| 851.1625 | 852.6125 | 854.0875 | 866.9625 | 868.4250 |
| 851.3625 | 852.8625 | 854.2875 | 867.3375 | 868.4500 |
| 851.8125 | 853.3125 | 866.3625 | 867.4375 | 868.7000 |

King County/Valley Comm - McDonald Pt. Site (confirmed)

| | | | | |
|-----------|----------|-----------|-----------|---------------|
| 856.4375* | 857.4375 | 858.7125* | 859.7125* | 860.7125* |
| 856.7125 | 857.7125 | 858.9375 | 859.9375 | 860.9375 Data |
| 856.9375 | 857.9375 | 859.2625* | 860.2625* | |
| 857.2625 | 858.2625 | 859.4375 | 860.4375 | |

King County/Valley Comm - Sobieski Site (unconfirmed)

| |
|----------|
| 855.9875 |
| 858.9625 |
| 859.4625 |
| 859.9625 |
| 860.4625 |
| 860.9625 |

King County/Valley Comm - Dodge Ridge Site (unconfirmed)

| |
|----------|
| 855.2375 |
| 856.4625 |
| 856.9625 |
| 857.4625 |
| 857.9625 |
| 858.4625 |
| 859.7625 |

King County/Valley Comm - Grass Mtn. Site (confirmed)

| |
|---------------|
| 856.2375* |
| 856.4875 |
| 857.2375 |
| 857.4875* |
| 858.2375* |
| 858.4875 Data |

(Note: Only a couple of ID's were monitored using this fill-in site. They were, perhaps, small town units on the outskirts of the county.)

Port of Seattle

(confirmed - unknown if its units roam throughout the larger system)

| |
|---------------|
| 851.1625 |
| 851.2625 |
| 851.3125 |
| 852.0125 |
| 852.8125 |
| 853.5125 |
| 853.5625 Data |
| 854.2625 Data |
| 854.3125 Data |

Bearcat Intercepts Trunked Radio



New...Bearcat Trunktracking radio

For over 28 years, thousands of radio operators have depended on scanners, digital voice loggers, CB, GMRS transceivers, weather forecasting equipment and more from Communications Electronics. To get your free fax-on-demand catalog, call 313-663-8888 from the telephone handset on your fax machine and follow the recorded voice prompts.

Bearcat® 3000XLT-A Radio Scanner

Mfg. suggested list price \$699.95/Special \$329.95

FREE - Get an extra BP2500 battery pack, a \$41.95 value when you order a Bearcat 3000XLT. Hurry...offer expires 10/31/97.

400 Channels • 20 banks • Twin Turbo Search/Scan

Frequency Transfer • VFO Control • Automatic Store

10 Priority Channels • Selectable Mode • Data Skip

Frequency step resolution 5, 12.5 & 25 kHz.

Size: 2-3/4" Wide x 1-1/2" Deep x 7-3/8" High

Frequency Coverage:

25,000-549,995 MHz, 760,000-823,995 MHz, 849,0125-868,995 MHz, 894,0125-1,300,000 MHz.

The Bearcat 3000XLT is the ideal handheld radio scanner for communications professionals. This handheld scanner scans at 100 channels per second and searches at a rate up to 300 steps per second. A selectable attenuator eliminates annoying intermodulation from adjacent frequencies in highly populated areas.

Selectable AM, Wide FM and Narrow FM modes allow you to change the default receiving mode of the BC3000XLT. For maximum scanning pleasure, order the following optional accessories: UA502 Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter \$14.95; LC3000 Deluxe swivel leather carrying case \$34.95; BP2500 rechargeable nickel-cadmium battery pack for up to five hours of dependable use \$29.95; ANTMMBNC Magnetic mount scanner antenna with BNC jack and 12 feet of cable \$29.95; ANTSBNC Glass mount scanner antenna with BNC cable \$29.95. The BC3000XLT comes with AC adapter, belt clip, flexible rubber antenna, earphone, owner's manual and one year limited Uniden warranty. Order today.

Bearcat® 9000XLT-A Radio Scanner

Mfg. suggested list price \$769.95/Special \$344.95

500 Channels • 20 banks • Alpha numeric display

Size: 10-1/2" Wide x 7-1/2" Deep x 3-3/8" High

Frequency Coverage: 25,000-549,995 MHz, 760,000-823,995 MHz, 849,0125-868,995 MHz, 894,0125-1,300,000 MHz.

The Bearcat 9000XLT is superb for intercepting communications transmissions with features like TurboSearch™ to search VHF channels at 300 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a selectable attenuator to help eliminate annoying intermodulation from adjacent frequencies in highly populated areas and selectable AM, Wide FM and Narrow FM modes that allow you to change the default receiving mode of the BC9000XLT. Other features include **Auto Store** - Automatically stores all active frequencies within the specified bank(s). **Auto Recording** - This feature lets you record channel activity from the scanner onto a tape recorder. Hi-Cut filter to help eliminate unwanted static noise. You can even get an optional **CTCSS Tone Board** (Continuous Tone Control Squelch System) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: PS001 Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter \$14.95; PS002 DC power cord - enables permanent operation from your vehicle's fuse box \$14.95; MB001 Mobile mounting bracket \$14.95; BC005 CTCSS Tone Board \$54.95; EX711 External speaker with mounting bracket & 10 feet of cable with plug attached \$19.95. The BC9000XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty.



TrunkTracking

Bearcat® 235XLT-A TrunkTracker

Mfg. suggested list price \$429.95/CEI price \$269.95

300 Channels • 10 banks • Trunk Scan and Scan Lists

Trunk Lockout • Trunk Delay • Extra battery & charger

10 Priority Channels • Programmed Service Search

Size: 2-1/2" Wide x 1-3/4" Deep x 6" High

Frequency Coverage:

29,000-54,000 MHz, 108-174 MHz, 406-512 MHz, 806-823,995 MHz,

849,0125-868,995 MHz, 894,0125-956,000 MHz.

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Military Frequency Bonanza

This month we are going to take a look at some of the frequencies that have been forwarded to this column by our readers. We have quite a bit of ground to cover, so let's get started.

First we present an extensive list of European military HF communications forwarded by Mr. TF in the UK. The mode used on all these frequencies is upper sideband (USB) unless otherwise indicated.

Denmark

Primrose-Royal Danish Air Force, Værløse
4577 (?), 6720, and 11246 kHz

France

Marguerite-French Air Force Circus Net (ARCN)
6712 (Marjolaine 2), 8972 (Racontar 1), 8993 (Vinaigrette 3), 9006, 11510, 13236 (Raphael), 18010 (Citadelle 1), 23254 kHz (Verite 3)

Other French Air Force Stations to watch for include:

| | |
|----------------|----------------------------------|
| Circus Blanc | Bangui, Central African Republic |
| Circus Bleu | La Reunion, Reunion Island |
| Circus Citron | Cayenne, Guyana |
| Circus Dore | Djibouti, Djibouti |
| Circus Fauve | Fort de France, Martinique |
| Circus Lilas | Libreville, Gabon |
| Circus Orange | Dakar, Senegal |
| Circus Tango | Paris/Villacoublay, France |
| Circus Tilleul | N'djamena, Chad |
| Circus Vert | Paris/Villacoublay, France |

FUI-French Air Force, Unknown location
3032 (ARCN 171), 3044 (C3 common), 3909 (ARCN 172), 5714, 6718, 6760, and 6996 kHz

FVI-French Air Force, Unknown location
5702 and 6757 kHz

Germany

DHM91-German Air Force Munster Air, Germany
(DHO 26 has also been heard on these frequencies)
3107 (Alpha), 3143 (Bravo), 4721 (Delta), 5687 (Echo), 8965 (Kilo), and 11217 kHz (Mike)
DHJ59-German Navy Wilhelmshaven, Germany
2625 (Maritime Rear Link 59/02), 4154 (MRL 59/04), 6779.0 (MRL 59/06), 8335 (MRL 59/08), 10163.5 (MRL 59/10), and 12415.5 kHz (MRL 59/12?)
Note: DHJ59, JWT-Stavanger Naval Radio (Norway), the Italian naval radio station IDR-Italian Naval Radio (Italy), and their associated stations operate two nets on HF. One net is for warships and the other is for maritime patrol aircraft. The maritime patrol net is known as the airborne communications net (ARCN).

DHJ?-German Naval Radio, unknown location
5018 kHz
DHJ52/67-German Naval Radio, unknown location
5722 kHz
DHJ61-German Naval Radio, unknown location
4604 and 5016 kHz
DHJ69-German Naval Radio, unknown location
4811 kHz
DHJ64-German Naval Radio, unknown location
4496.5, 4744 (shared frequency with JWT), and 4836 kHz
DHJ78-German Navy Flensburg, Germany (call word Argonaut)
5691, 6730, 6733, 6747, 6750 (78/01), 6752, and 9035 kHz

Ireland

Irish Air Corps: 5254 and 5708 kHz

Italy

Italian Air Force (ARCN)
3143 (ARCN 321), 4721 (ARCN 322), 5714 (ARCN 323), and 6733 kHz (ARCN 324)

| |
|--|
| IBA-US Navy Napoli, Italy |
| 9207.5 kHz |
| ICA-Italian Naval Radio Ancona, Italy |
| 2350.5 |
| ICH-Italian Naval Radio La Maddalena, Italy |
| 2329.5 and 6746 kHz |
| ICM-Italian Naval Radio Unknown location |
| 4711 kHz |
| ICN-Italian Naval Radio Napoli, Italy |
| 4116.0 |
| ICS-Italian Naval Radio La Spezia, Italy |
| 4439 and 6873.5 kHz |
| ICT-Italian Naval Radio Taranto, Italy |
| 4154.5 and 6708 kHz |
| IDJ-Italian Naval Radio Unknown location |
| 6708 kHz |
| IDR-Italian Naval Radio , Rome (ARCN) |
| 3182, 4721, 4723, 4839, 6708, 6733, 6746, and 6755 kHz |
| IGJ-Italian Naval Radio Augusta, Italy |
| 4168.5 and 6708 kHz |
| I?-Italian Naval Radio , Unknown location |
| 5405.0 (shore station heard calling I041) |

Norway

JWT-Stavanger Naval Radio, Norway
2413, 2687, and 2744 kHz

Portugal

CTP-NATO Naval Radio, Lisbon, Portugal
4742 (CTP with RTTY over RAF Architect a couple of times), 6730 (voice and RTTY), and 6699 kHz (not used very often, but I have heard USN and European voice call up and RTTY)

■ Airborne Radio Communications Nets (ARCN)

Ary Boender referred to ARCN 131 for JWT in the August 94 *Ute World* logs under the 6727 kHz entry. ARCN 131 would normally refer to a three megahertz frequency.

| | | |
|------|----------|--------------------------------|
| 6727 | ARCN 405 | Common European ARCN frequency |
| 6697 | ARCN 113 | MKL-RAF Edinburgh, UK |
| 9036 | ARCN 115 | MKL-RAF Edinburgh, UK |

There are several ARCN channels set aside for common use such as 420(?) ARCN 401 which includes stations like MKL; PBV-Dutch Air Force Vaikenburg, Netherlands; DHJ59, and IDR.

A huge *Utility World* thanks goes out to Mr. TF for his fine list of HF European military voice frequencies.

■ MARS in Europe

No, I'm not talking about the Mars Pathfinder mission in this portion of the column; I'm talking about the U.S. Army MARS frequencies currently being used in Europe. Many *UW* thanks to Sidney for sending us the comprehensive list of Army MARS frequencies in Table 1.

■ USAF Tanker Callsigns

From time to time we get a few requests for U.S. Air Force callsigns for the various KC-135 tanker units commonly heard on the global HF system (GHFS) frequencies. Table 2 a list courtesy of T. Okamura in Japan and his excellent Iron Birds website at URL: <http://www.asahinet.or.jp/~uq6t-okmr/callsigns/esdke.html>

TABLE 1: U.S. Army MARS frequencies in Europe

| Design ² | Authorized Frequency (kHz) | USB (D) | LSB (C) | Areas | Remarks |
|---------------------|----------------------------|----------------------|---------------------|-----------------|-------------------------|
| A1 | 3855.0 | 3883.5 | 3886.5 ¹ | Germany-Germany | |
| B1 | 3897.5 | 3896.0 | 3899.0 | Germany-Germany | |
| C1 | 4015.0 | 4013.5 | 4016.5 | Germany-Germany | |
| D1 | 6997.5 | 6996.0 ¹ | 6999.0 | Europe-Europe | Primary Data Network |
| E1 | 4870.0 | 4868.5 | 4871.5 | Germany-Germany | |
| F1 | 5432.0 | 5430.5 | 5433.5 | Germany-Germany | |
| G1 | 141.775 MHz ¹ | FM | | Germany-Germany | Local Voice Contacts |
| H1 | 6910.0 | 6908.5 | 6911.5 | Germany-Germany | |
| I1 | 6940.0 | 6938.5 | 6941.5 | Germany-Germany | |
| J1 | 4590.0 | 4588.5 | 4591.5 | Germany-Germany | |
| A2 | 3871.0 | 3869.5 | 3872.5 | Germany-Bosnia | |
| B2 | 5737.0 | 5735.5 | 5738.5 | Germany-Bosnia | |
| C2 | 6882.5 | 6881.0 | 6884.0 ¹ | Germany-Bosnia | |
| D2 | 7574.5 | 7573.0 | 7576.0 | Germany-Bosnia | |
| | 5401.0 | 5399.5 | 5402.5 | Germany-USA | |
| | 6825.0 | 6823.5 | 6826.5 | Germany-USA | |
| | 7475.0 | 7473.5 | 7476.5 | Germany-USA | |
| | 9810.0 | 9808.5 | 9811.5 | Germany-USA | |
| | 10327.0 | 10325.5 | 10328.5 | Germany-USA | |
| | 11070.0 | 11068.5 | 11071.5 | Germany-USA | |
| | 11455.0 | 11453.5 | 11456.5 | Germany-USA | |
| | 12072.0 | 12070.5 | 12073.5 | Germany-USA | |
| | 14403.5 | 14402.0 ¹ | 14405.0 | Germany-USA | Primary Phone Patch Net |
| | 14405.0 | 14403.5 | 14406.5 | Germany-USA | |
| | 14406.5 | 14405.0 | 14408.0 | Germany-USA | |
| | 14665.0 | 14663.5 | 14666.5 | Germany-USA | |
| | 15551.0 | 15549.5 | 15552.0 | Germany-USA | |
| | 16041.0 | 16039.5 | 16042.0 | Germany-USA | |
| | 19024.0 | 19022.5 | 19025.5 | Germany-USA | |
| | 19532.5 | 19531.0 | 19532.5 | Germany-USA | |
| | 20975.0 | 20973.5 | 20976.5 | Germany-USA | |
| | 20992.5 | 20991.0 | 20994.0 | Germany-USA | |
| | 20994.0 | 20992.5 | 20995.5 | Germany-USA | |
| | 20995.5 | 20994.0 | 20997.0 | Germany-USA | |
| | 27994.0 | | AM | Germany-Germany | |

Notes:

¹ This call frequency is also monitored outside of scheduled net times

² Designators for the frequencies above are made by combining the basic designator shown for each frequency with the modifier for mode. For example, A1C=3886.5 kHz (LSB)

TABLE 2: U.S. Air Force callsigns for the various KC-135 tanker units

| Units | | Aircraft | Unit Callsign | Reach Mission Callsign |
|-------|----------|---------------------|---------------|------------------------|
| ACC | 366 Wing | 22 ARS | KC-135R | Gunfighter |
| AMC | 6 ARW | 91 ARS | KC-135R | Bolt |
| | 19 ARG | 99/712 ARS | KC-135R | Rhet |
| | 22 ARW | 344/349/350/384 ARS | KC-135R/T | Caddo/Turbo |
| | 89 AW | 1 AS | Various | Venus/SAM |
| | 92 ARW | 43/92/96/97 ARS | KC-135R/T | Falls/Earl/Pride/Aspro |
| AFRES | 319 ARW | 905 ARS | KC-135R/T | Raid/Exxon |
| | 434 ARW | 72 ARS | KC-135R | Mash |
| | | 74 ARS | KC-135R | Indy |
| | 452 ARW | 336 ARS | KC-135E | Rats |
| | 507 ARW | 465 ARS | KC-135R | Okie |
| | 916 ARW | 77 ARS | KC-135R | Backy |
| | 927 ARW | 63 ARS | KC-135E | Auto/Piston |
| ANG | 940 ARW | 314 ARS | KC-135E | Darr |
| | 101 ARW | 132 ARS | KC-135E | Maine |
| | 107 ARW | 136 ARS | KC-135R | Fuzzy |
| | 108 ARW | 141 ARS | KC-135E | Jersey |
| | | 150 ARS | KC-135E | Topcat |
| | 117 ARW | 106 ARS | KC-135R | Dixie |
| | 121 ARW | 145 ARS | KC-135R | Tazz/Gorky |
| | | 166 ARS | KC-135R | Sluff |
| | 126 ARW | 108 ARS | KC-135E | Coder |
| | 128 ARW | 126 ARS | KC-135R | Upset |
| | 134 ARW | 151 ARS | KC-135E | Soda |
| | 141 ARW | 116 ARS | KC-135E | Expo |
| | 151 ARW | 191 ARS | KC-135E | Utah |
| | 154 ARW | 203 ARS | KC-135R | Hoku |
| | 155 ARW | 173 ARS | KC-135R | Husker |
| | 157 ARW | 133 ARS | KC-135R | Pack |
| | 161 ARW | 197 ARS | KC-135E | Copper |
| | 163 ARW | 196 ARS | KC-135R | Grizzly |
| | 168 ARW | 168 ARS | KC-135R | Chena |
| | 171 ARW | 146 ARS | KC-135E | Steel |
| | | 147 ARS | KC-135E | Shaky |
| | 186 ARW | 153 ARS | KC-135R | Keys |
| | 190 ARW | 117 ARS | KC-135D/E | Tempo |
| AETC | 97 AMW | 55 ARS | KC-135R | Spatz/Gassr |
| USAFE | 100 ARW | 351 ARS | KC-135R | Quid |
| PACAF | 18 Wing | 909 ARS | KC-135R | Tora |
| AFMC | 4950 TS | 4952 TS | Various | Ager |



Abbreviations used in this column

| | | | |
|---------|--|---------|---|
| AFB | Air Force Base | INS | Immigration and Naturalization Service |
| AIG | Address Information Group | IRA-ARQ | International reference alphabet diplomatic data burst teleprinter system |
| AM | Amplitude Modulation | MARS | Military Affiliate Radio System |
| ANDVT | Advanced Narrowband Digital Voice Terminal | Meteo | Meteorology |
| ARQ | Synchronous transmission and automatic repetition teleprinter system | NCC | National Coordinating Center |
| ARQ-E | Single-channel ARQ teleprinter system | OET | Office of Emergency Transportation |
| ARQ-E3 | Single-channel ARQ teleprinter system | PACTOR | Teleprinter systems combining certain characteristics of packet radio and SITOR |
| ARQ-M2 | Multiplex ARQ teleprinter system with two data channels | PIAB | Presse- und Informationsamt der Bundesregierung |
| ASECNA | Agence pour la Securite de la Navigation Aerienne en Afrique et a Madagascar | QSX | Q Code. I am listening to ... |
| COMMNAV | Communications/ Navigation | RTTY | Radioteletype |
| CW | Continuous Wave (Morse code) | SAM | Special Air Mission |
| DLA | Defense Logistics Agency | Selcal | Selective Calling |
| DV | Distinguished Visitor | SITOR | Simplex teleprinting over radio system |
| EAM | Emergency Action Message | SITOR-A | Simplex teleprinting over radio system, mode A |
| FAA | Federal Aviation Administration | SITOR-B | Simplex teleprinting over radio system, mode B |
| FAF | French Air Force | U.S. | United States |
| FEC | Forward Error Correction | USA | U.S. Army |
| FEC-A | One-way traffic FEC teleprinting system | USACE | U.S. Army Corps of Engineers |
| FF | French Forces | USAF | U.S. Air Force |
| FN | French Navy | Unid | Unidentified |
| GHFS | Global HF System | USN | U.S. Navy |
| HF | High Frequency | USB | Upper Sideband |
| ICRC | International Committee for the Red Cross | UTC | Coordinated Universal Time |
| ID | Identification | VIP | Very Important Person |

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Time Universal)

| | | | |
|--------|--|--------|--|
| 1609.5 | LGB-Rogaland Radio, Norway, with CW marker at 0358. (Ary Boender-Netherlands) | 2892.3 | MGJ-Royal Navy Faslane, England, with a 75 baud RTTY CARB broadcast at 2202. (Boender-Neth) |
| 1619.5 | PCH-Scheveningen Radio, Netherlands, with CW marker at 0359. (Boender-Neth) | 3245.0 | UCE-Arkhangelsk Radio, Russia, working an unid vessel using 100 baud SITOR-A at 2100. (Boender-Neth) |
| 2423.5 | SAB-Goteborg Radio, Sweden, using 100 baud SITOR-A calling selcal XPIM at 0436. (Boender-Neth) | 3313.0 | HEP3-Kantonspolizei Zurich, Switzerland, with CW V marker at 2103. (Boender-Neth) |
| 2474.0 | PBC-Dutch Navy Goeree, Netherlands, with 75 baud RTTY CARB broadcast at 0432. (Boender-Neth) <i>Sorry, Ary; but what's CARB?-Larry</i> | 3435.0 | Unid NATO (possibly Royal Navy) station transmitting 100 baud RTTY encrypted messages separated by 16 RY's + VMGCTNJHB at 2105. (Boender-Neth) |
| 2608.0 | FUO-FN Toulon, France, with a 75 baud RTTY test tape at 0418. (Boender-Neth) | 3764.0 | PBB-Dutch Navy Den Helder, Netherlands, with a 75 baud RTTY CARB broadcast at 2107. (Boender-Neth) |
| 2643.5 | SPS-Witowo Radio, Poland, with a CW marker at 0415. (Boender-Neth) | 3840.0 | SYN2-Israeli Mossad number station at 1645, also on 4665/5628. (Takashi Yamaguchi-Nagasaki, Japan) |
| 2716.0 | SAB-Goteborg, Sweden, using 100 baud SITOR-A calling selcal TPPF at 0412. (Boender-Neth) | 4002.0 | YRR2-Bucharest Meteo, Romania, with 50 baud RTTY synoptic observations at 2106. (Boender-Neth) |
| 2727.0 | DAN-Norddeich Radio, Germany, with a CW marker at 0412. (Boender-Neth) | 4031.0 | P-Single letter HF CW marker, Russian Navy Kaliningrad at 2108. (Boender-Neth) |
| 2781.0 | GND4-Stonehaven Radio, England, using 100 baud SITOR-A calling an unid vessel then CW marker at 2155. (Boender-Neth) | 4050.0 | Unid station sending CW single figures separated by a space mark. Ended with three long dashes (short zero's) at 2110. (Boender-Neth) |
| 2789.0 | FUE-FN Brest, France, with a 75 baud RTTY test tape at 0411. (Boender-Neth) | 4064.0 | EBO-Spanish Navy Vigo, Spain, with CW V marker at 2123. (Boender-Neth) |
| 2815.0 | IDR8-Italian Navy Rome, Italy, with a 75 baud RTTY CARB broadcast at 2205. (Boender-Neth) | 4083.0 | Unid multi tone signal (jammer?) from 1935-2125. Also noted one month later from 1830-1920. Also Spanish Navy stations noted here. Sounded like an exercise. Lots of counting and spelling at 1940. (Boender-Neth) |
| 2829.5 | SPB-Szczecin Radio, Poland, with a 100 baud SITOR-B traffic list at 2200. (Boender-Neth) | 4084.0 | Strong multi-tone jammer noted at 1830. (Boender-Neth) |
| 2845.0 | PBB-Dutch Navy Den Helder, Netherlands, with a 75 baud RTTY CARB broadcast at 2204. (Boender-Neth) | 4227.0 | IGJ42-Italian navy Augusta, Italy, with a 100 baud RTTY CARB broadcast at 2120. (Boender-Neth) |
| 2872.0 | Shanwick Aero, Ireland, working various aircraft at 0404. (Boender-Neth) | 4240.0 | LGW-Rogaland Radio, Norway, with CW traffic list at 2132. (Boender-Neth) |
| | | 4246.0 | Unid NATO (possibly Royal Navy) station transmitting 100 baud RTTY encrypted messages separated by 16 RY's + VMGCTNJHB at 2134. (Boender-Neth) |
| | | 4295.0 | HWN-FN Pairs, France, with 150 baud RTTY test tape. SXA34-Greek Navy Piraeus, Greece, with CW marker at 2140. (Boender-Neth) |
| | | 4303.0 | OXZ-Lyngby Radio, Denmark, with CW traffic list at 2210. (Boender-Neth) |
| | | 4465.0 | FDI8-FAF Nice, France, with CW marker at 2144. (Boender-Neth) |
| | | 4485.0 | Unid station in CW at 1654 transmitting: 275 275 9T 9T 38 38 plus 5-figure groups, each group was repeated. (Boender-Neth) |
| | | 4495.0 | Lancelot worked Firebrick followed by Nightwatch 01 calling. Lancelot at 0946. (Haverlah-TX) |
| | | 4550.5 | TBU5-Turkish Navy station, unknown location, with CW marker "TBDJ de TBU5" at 2049. (Boender-Neth) |
| | | 4583.0 | DKK2-Hamburg Meteo, Germany, with 50 baud RTTY marine weather at 2053. (Boender-Neth) |
| | | 4622.0 | Unid station in CW at 2155 transmitting: BT NR47 A 94 23:58:02 1997 BT plus 5-letter groups, many messages. (Boender-Neth) |
| | | 4721.0 | Unid station RSSA repeating "V PV2S de RSSA" at 1050 in CW. (Yamaguchi-Japan) |
| | | 4790.0 | FDE14-FAF Contrexville, France, with a CW V marker at 1719. (Boender-Neth) |
| | | 4813.0 | LZA8-Sofia Meteo, Bulgaria, with 50 baud RTTY synoptic observations at 2150. (Boender-Neth) |
| | | 4880.0 | ULX-Israeli Mossad number station at 1700. (Yamaguchi-Japan) |
| | | 5091.0 | JSR2-Israeli Mossad number station at 1701. (Yamaguchi-Japan) |
| | | 5117.0 | Spanish female 5-digit number station in AM at 0400. Weak but readable on the East Coast. (Gary Seven via e-mail) |
| | | 5141.9 | Unid station with a 96 baud ARQ-M2 tuned on space only signal at 1646. (Hall-RSA) |
| | | 5153.8 | P-Single letter HF CW marker, Russian Navy Kaliningrad at 1920. (Boender-Neth) |
| | | 5154.0 | R-Single letter HF CW marker, Russian Navy Ustinov at 1920. (Boender-Neth) |
| | | 5177.0 | Unid station with a PACTOR signal, unable to decode at 1650. Suspect ICRC from Bosnia Herzegovina. (Hall-RSA) |
| | | 5266.5 | HEP5-Kantonspolizei Zurich, Switzerland, with a V CW marker at 2114. (Boender-Neth) |
| | | 5342.0 | FDY-FAF Orleans, France, with a V CW marker at 2115. (Boender-Neth) |
| | | 5383.9 | Unid station with a 96 baud ARQ-M2 tuned on space only signal at 1658. (Hall-RSA) |
| | | 5439.5 | Unid station L9CC repeating "CP17 de L9CC UAA" in CW at 1256. (Yamaguchi-Japan) |
| | | 5800.0 | Mulberry working Nightwatch 01 at 0114. (Haverlah-TX) Spanish female 5-digit number station in AM at 0300. Very weak but readable. (Gary Seven via e-mail) |

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|---------|--|---------|--|
| 5820.0 | YHF-Israeli Mossad number station at 1600. (Yamaguchi-Japan) | 10551.3 | GFL23-Bracknell Meteo, England, with 75 baud synoptic observations at 2006. (Boender-Neth) |
| 5887.5 | IMB2-Roma Meteo, Italy, with 50 baud RTTY synoptic observations at 2118. (Boender-Neth) | 10935.0 | Unid station transmitting ANDVT communications at 0045. (Jones-CA) |
| 5913.9 | HLL4-Seoul Meteo, South Korea (tentative), with a 50 baud RTTY broadcasts at 1707. Heavy USB interference. (Hall-RSA) | 11053.0 | SAM 201 working Andrews VIP with request at 1818. PACAF 01 departed Fort Worth, Texas, ETA Hickam AFB at 0745, working Andrews VIP with phone patch traffic at 0025. (Jones-CA) |
| 6322.1 | ZSD-Durban Radio, South Africa, SITOR-A/B traffic list that also gave the ZSC-Capetown Radio callsign at 1714. (Hall-RSA) | 11181.0 | WGY 914 (very strong here) worked Appaloosa Farm (weak) and passed a "Hotel" message. At 1757 Appaloosa Farm called Anathema with no response heard. (Haverlah-TX) |
| 6348.0 | HWN-FN Pairs, France, with 150 baud RTTY test tape at 0758. (Boender-Neth) | 11214.0 | SAM 375 (DV-2 + 9) working Andrews VIP with phone patch to COMNAV at 1635. (Jones-CA) |
| 6357.0 | SAA-Karlskrona Radio, Sweden, with a CQ CW marker at 0756. Also with a CW QSX marker at 2223. (Boender-Neth) | 11220.0 | SAM 300, inbound home station, working Andrews VIP regarding a 0415 arrival at Andrews. Transmission at 2246. (Jones-CA) |
| 6425.0 | UGC-St. Petersburg Radio, Russia, with CW QSX marker tape at 2226. Also with a CW QSX marker at 2105. (Boender-Neth) | 11267.0 | Stiletto with a 26-character EAM. At 2148 and 2207 Stiletto with a 20-character EAM simulcast on 6697.0. (Haverlah-TX) |
| 6493.5 | LYL-Klaipedo Radio, Lithuania, working an unid vessel in CW at 2220. (Boender-Neth) | 11460.0 | Casey 01 working Andrews VIP regarding 0105 blocktime at Andrews AFB. Transmission at 2116. Nightwatch 01 radio op working Casey 01 radio op with informal comms at 0240. (Jones-CA) |
| 6697.0 | Stiletto with a 20-character EAM broadcast at 2148 and 2207, simulcast on 11267.0. (Haverlah-TX) | 12691.3 | FUX-FN Le Port, Reunion Island, with a 75 baud RTTY test tape at 1316. (Hall-RSA) |
| 6730.0 | SPAR 19 working Andrews VIP regarding a 0640 arrival at MacDill AFB. Transmission at 0349. (Jones-CA) | 13440.0 | SAM 26000 (DV-2 + 26) inbound Yokota AFB, Japan, working Andrews VIP with a phone patch to SAM Command at 0039. (Jones-CA) |
| 6768.0 | Spanish female 5-digit number station in AM at 0400. Very weak and barely readable. (Gary Seven via e-mail) | 13878.0 | SAM 375 here with a brief signal check for Andrews VIP radio at 1800. (Jones-CA) |
| 6826.0 | Spanish female 5-digit number station in AM at 0300. Also very weak, but I think it's the same message as 5800 kHz. (Gary Seven via e-mail) | 13936.5 | ICRC Geneva using PACTOR at 1556. Unable to decode. (Hall-RSA) |
| 6896.7 | Unid station with a 96 baud ARQ-M2 tuned on space only signal at 1725. (Hall-RSA) | 13960.0 | SAM 27000 on the ground at Yokota AFB working Andrews VIP regarding going off-mike for about 40 minutes at 0450. (Jones-CA) |
| 6983.0 | Spanish female 5-digit number station in AM at 0200 (Friday UTC). (Gary Seven via e-mail) | 14396.0 | SHARES net monitored at 1609 for about 25 minutes. Net control stations were AFA3HY-USAF MARS Shawnee, KS (stated he was SHARES coordination station central) and AAA0USA-USA MARS Tacoma, WA. The bulk of the check-ins were MARS stations, but also heard the following: AGA6LA-USAF MARS Los Angeles, CA; AAR6SR-USA MARS (New Mexico); AFA2JF-USAF MARS Hudson, FL; AGA5PD-USAF MARS (Oregon); AAR5FD-USA MARS; AAA6USA-USA MARS Fort Sam Houston, San Antonio, TX; DLA303-DLA Bremerton, WA; WGY695 (He said his location was in Illinois); AFA4UB-USAF MARS Slidell, LA; KGD34-NCC Arlington, VA; KAD640-INS Swanton, VT; WUJ5-USACE Anchorage, AK; KWB406-OET Ames, IA; AAR0JN-USA MARS Keno, OR; NNN0NUW-USN MARS Oak Harbor, WA; NNN0QWC-USN MARS; and KIT88-FAA Martinsville, WV. (Gordon Levine-Anaheim, CA) |
| 6993.0 | SAM 375 checking Andrews VIP here for possible new primary frequency at 1627. PACAF 01 working Andrews VIP for signal checks regarding possible new primary freq. Checked an omni antenna out of the McClellan AFB remote site around 0215. (Jeff Jones-CA) | 14462.8 | TNL-ASECNA Brazzaville, Congo, with a 96 baud ARQ-M2 idling signal at 1144. (Hall-RSA) |
| 7586.1 | RFVITT-Unid station at 1729 using 92 baud ARQ-E. RFVITT listed as Dzaoudzi, Mayotte Island. Nothing noted on demodulator screen. (Hall-RSA) | 14801.6 | RFV1-FF Le Port, Reunion Island, with a 100 baud ARQ-E3 idling signal at 1137. (Hall-RSA) |
| 7767.1 | Aveira/Pam/Lubango using SITOR-A at 1628 with Portuguese traffic to CVRRD/PAM/Luanda. (Hall-RSA) | 15041.0 | CASEY 01, inbound Hickam AFB, working Andrews VIP regarding a 0320 arrival. Transmission at 0243. (Jones-CA) |
| 7805.5 | FDG-FAF Bordeaux, France, with a CW marker at 0802. (Boender-Neth) | 15743.3 | VNA Hanoi, Vietnam, at 0701 with a 50 baud RTTY English news bulletins. (Hall-RSA) |
| 7831.0 | Mulberry working Nightwatch 01 at 0351. (Haverlah-TX) | 15855.8 | German embassy Bujumbura (tentative) at 0842 with a 223.7 baud IRA-ARQ transmission. Unable to decode. (Hall-RSA) |
| 7831.8 | 5ST-ASECNA Antananarivo, Madagascar, with 48 baud ARQ-E3 aeronautical traffic at 1247. (Robert Hall-South Africa) | 16078.9 | RFV1-FF Le Port, Reunion Island, with French traffic to RFFV-Air SACA Paris and RFFUE-Air SERPECA Tours using 100 baud ARQ-E3 at 1105. (Hall-RSA) |
| 7841.0 | Lancelot worked Firebrick. At 0945 Nightwatch 01 called Lancelot. (Haverlah-TX) | 16808.0 | SPH-Gdynia Radio, Poland, with SITOR-B Polish traffic and traffic list at 1500. (Hall-RSA) |
| 7863.5 | SPW-Warsaw Radio, Poland, with a CW marker at 0804. (Boender-Neth) | 16829.1 | USU-Mariupol Radio, Russia, with SITOR-A traffic at 1614. (Hall-RSA) |
| 7956.0 | X2IG-Unid station sending in CW at 0800: SERL DE X2IG for 15 minutes, then off. (Boender-Neth) | 16836.6 | WLO-Mobile Radio, AL, with SITOR-A idler at 1611. (Hall-RSA) |
| 7983.9 | RFTJ-FF Dakar, Senegal, with 48 baud ARQ-E3 Code de Voie on TJF circuit. (Hall-RSA) | 16987.9 | RFV1-FF Le Port, Reunion Island, with a Code de Voie 100 baud ARW-E3 transmission at 1048. Circuit ID was CRE. (Hall-RSA) |
| 8032.0 | SAM 971 working Andrews VIP with periodic signal checks at 0410. (Jones-CA) | 18320.7 | RFTJ-FF Dakar, Senegal, at 1240 with a 192 baud ARQ-E3 Code de Voie transmission. (Hall-RSA) |
| 8186.0 | Spanish female 5-digit number station in AM at 0200. This seems to be very active every Sunday night on the East Coast. Loud and clear. (Gary Seven via e-mail) | 18380.5 | RFFAAR-Directe Prosecurdef Paris, France, with French press news reports to AIG 1038/39 and many others using 100 baud ARQ-E3 at 1010. RFFISOM-Paris Naval with 5-letter groups to RFVIGRN (naval ship at Le Port) using 100 baud ARQ-E3 at 1040. (Hall-RSA) |
| 8192.8 | 9MR-Malay Naval sending a 50 baud RTTY test tape at 1630. (Hall-RSA) | 18527.2 | NDGA-French embassy N'Jamena, Chad, transmitting a 200 baud ARQ-90 idling signal and messages (unable to decode) at 0836. (Hall-RSA) |
| 8968.0 | McClellan as lead GHFS station with a 39-character EAM (BCVNAT..) at 0145. (Haverlah-TX) | 18704.4 | PIAB Bonn, Germany, with a 96 baud FEC-A German DPA news bulletins at 0842. (Hall-RSA) |
| 9016.0 | Mulberry called Nightwatch 01 and then moved to Z150 at 0113. At 0201 Stability called and raised Mulberry. At 0205 Mulberry broadcast a 26-character EAM (RIIARJ..). At 0247 Mulberry broadcast a 79-character EAM (BC5GFJ..). At 1749 Nightwatch 01 called War 46. (Haverlah-TX) | 18755.9 | Interpol Wiesbaden, Germany, with SITOR-A traffic in German for New Delhi at 1220. Interpol Tehran with SITOR-A traffic in English to New Delhi at 1244. Interpol Rome with English traffic to New Delhi at 1256 on a wanted Indian subject. (Hall-RSA) |
| 9250.8 | English female Lincolnshire Poacher number station at 2147. Ray Carmen-Canton, OH, via George Zeller) <i>Welcome aboard, Ray, and thanks, George, for the forward via e-mail-Larry.</i> | | |
| 9320.0 | Crossbow-3 working Katanna for authentication to enter the net at 0510. Katanna working Mike-Charlie-Tango. Unable to establish comms via cellphone at 0530. (Jones-CA) | | |
| 10046.0 | 4XZ-Israeli Navy Haifa, Israel, with a V CW marker at 2012. (Boender-Neth) | | |
| 10204.0 | Stiletto checking out of the net in the blind at 2348. By 0017 Nightwatch 01 was active on freq and attempting to work an unid station who wanted to enter the net. Moved to 11181.0. (Haverlah-TX) | | |
| 10215.0 | HNZ48-Jeddah Meteo, Saudi Arabia, with 50 baud RTTY synoptic observations at 2003. (Boender-Neth) | | |
| 10299.2 | HSW68-Bangkok Meteo, Thailand, with 50 baud RTTY aero weather and codes at 1310. (Hall-RSA) | | |

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Respect for Neighbors

Might certainly makes right in the way VOA and other western broadcasters treat SW stations in Mexico and Canada—as if they don't exist. With powers ranging from 50 watts to 5 kW, and permanently assigned frequencies, our NAFTA neighbors don't have the clout to muscle off interference, and their channels are often blocked. Just try to hear the active Canadians on 6005, 6030, 6070, 6130, 6160, or the Mexicans on 5985, 6010, 6185, 9705.

Why is WYFR on 5985 when XERMX needs it? VOA and RFE/RL use 9705 most of the day from a variety of sites; even

Greece to Pakistan is a problem here next to Mexico at 0100. Deutsche Welle uses 6185 much of the night.

It seems our neighbors do not have anyone representing their interests at frequency coordination conferences, but the big guns can hardly pretend they are unknown. Mexican and Canadian frequencies should be deliberately avoided; on SW they are too close to be shared. At least some of the Mexicans are trying to increase their power, but they shouldn't have to fight off uncaring Yankee interference.

ALASKA KNLS has been broadcasting for R. Free Asia since January (Mike Osborne, KNLS English programmer) 2100-2200 Chinese 11765, 2200-2300 Korean & 2300-2400 Chinese on 11785 (Nikolay Rudnev, Russia, *NASWA Listeners Notebook*)

ANGOLA V. of the Resistance of the Black Cockerel, UNITA opposition station from Jamba, VORGAN, 0450-0900 on 7090v, 1050-1430 9770, 1650-2100 5985 including irregular English at 1830-1845 (BBCM)

ARGENTINA R. Armonia, 4800.1 at 0743, jazz//stronger 3200, both harmonics (Paul Ormandy, NZ, *Cumbre DX*)

LS11, La Plata, on 1270 MW has a program *De Colección* on SSB SW beamed to Antarctica Sun *2300 to Mon 0200, on one or two of: 3390, 4469, 5400, 5415, 8098, sometimes delayed by soccer (Raymundo Cruz, La Plata via Barrera) Also try 13361 or 13365 (Jorge Aloy via Barrera) Includes listener call-in at 0115-0130 with cassette prizes; will QSL reports to: Sr. Jorge Bourdet, Casilla 96, 1900 La Plata. Include 2 IRCS (Gabriel Iván Barrera, *BC-DX*)

ARMENIA V. of Armenia, English to Americas and Europe at 2030-2100 on 9965 [only]; signature tune is *Spring* by Father Gomitas, an Armenian monk who in his short life composed thousands of songs and melodies, based on Armenian folk tunes. He died in 1915, during the first days of the Armenian genocide, among 600 intellectuals who were massacred first. After ID in Armenian, *Yerevane Khosoum*—Yerevan is speaking—opening melody is *Dance of the Rose Maidens* by Khachaturian (VOA Canada Bureau) 9965 is a megawatt from Kamo, blasts into Europe but overmodulated (Kai Ludwig, *Cumbre DX*)

AUSTRALIA Jean-Gabriel Mangay has been appointed new Network Manager of Radio Australia from Sept 19; has worked in Asia and Pacific in English and French services (RA news online via Daniel Say, *rec.radio.shortwave*) The Asian Relations minister for the Northern Territory, Eric Poole, has called on the federal government to review its decision to close RA transmitters near Darwin (RA via BBCM) Frequencies opting out for *Grandstand* ball game coverage Sat/Sun: 17750, 15510, 15240, 12080 (via BBCM) Sat 0200-0800, Sun 0300-0800, one hour earlier Oct-Mar (RA via *BC-DX*) From Aug 24, RA added 0600-0830 11880 to Pac (Arie Schellaars, RA via *Electronic DX Press*)

HCJB has been given property in Kununurra, WA, and the mission is investigating the possibility of establishing an international broadcasting facility on this site (HCJB World Radio-Australia Newsletter via *Cumbre DX*)

BELGIUM RVI's International Listeners' Club will be cancelled at end of October due to budget cuts, but QSLs will still be issued (RVI *Radio World* via Steven Cline)

BOLIVIA SIM International, whose ELWA was destroyed twice in Liberia, is setting up a new SW station in Cochabamba for the Quechua-speaking highland and valley people. Transmitter expected soon, to use an "H" antenna beaming upwards for close-in coverage, target first half of 1998 if licensed soon. Name means "new messenger" (HCJB *DX Partyline*) Sounded like R. Montochaski, per Paul Erickson interview on *DXPL* (Jerry Berg, *Electronic DX Press*)

BOUGAINVILLE R. Free Bougainville heard on 3865 from 1104 to 1154* with island to rock music, IDs at 1116, 1152, s/off with chorus of men and women, anthem? (Hans Johnson, ID, *Cumbre DX*)

BRAZIL R. Dif. Taubaté is back on 4925 after long absence, 500 watts, 24 hours, to increase to 1 kW (de Castro, Brazil, *Cumbre DX*) R. Gazeta presumed, 15325 at 0125-0325 pop music,

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; J-97=May-Sept; Z-97=Summer season; W-97=Winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there.*

soap operas, no explicit IDs (Jay Novello, NC)

BULGARIA E-mail to R. Bulgaria may now be sent to the private account of an employee: <tgeorgi@mail.techno-link.com> (R. Bulgaria via Andreas Erbe via Kai Ludwig)

RADIO BULGARIA



CAMBODIA National Voice of Cambodia is the ID now in English at 1200-1215 on 11940.4 (Roland Schulze, Philippines, *Cumbre DX*)

COLOMBIA Clandestine monitoring: R. Patria Libre, 6250 at 2158-2216 in June, but not in August; instead heard FARC station reactivated after 11 months, Voz de la Resistencia weaker on 6259.2 at 2158-2230 closing with 4-minute vocal version of *La Internacional* (Henrik Klemetz, *Dateline Bogotá* via DSWCI *DX Window*)

COMORO ISLANDS R. Comoro director told me in August they hoped to have technical problems with SW repaired and back on the air in two months, 3331 at 0300-2100 in French, Arabic and Comoro (Mahendra Vaghjee, Mauritius, *NASWA Listeners Notebook*)

COSTA RICA For at least a week in August, RFPI 7385 was hit by bubble-jamming, a year after a previous jamming incident (gh)

CUBA P-mail from Europe to RHC takes two to six months before reaching the station, partly because a governmental service takes a very close look at each and every letter coming from abroad! They do receive E-mail but do not answer (Fabien Serve via Francis Mougenet, DSWCI *DX Window*) RHC's 13715 sounds like two unsynchronized transmitters, wobble and audio phase cancellation for English 2030, French 2130 (gh)

CZECH REPUBLIC R. Prague's German, French, and Spanish services close at yearend, leaving only English and Czech (Kai Ludwig, Germany) Future of foreign service unclear, 25% budget cut for 1998: decision in Sept or Oct. The three dropped languages may continue via Internet (Karel Honzik, Czech Rep., DSWCI *DX Window*) Foreign Ministry is seeking new operators for foreign broadcasting and Internet; French and German only on the latter (CTK via BBCM)

ECUADOR [non] Rich McVicar, ex-HCJB, is working the overnight announcing shift weeknights at religious WMHR, 102.9, Syracuse, NY, plus affiliates and translators in western NY; low-key, did not hear him giving his name (Tim Hendel, NY, *World of Radio*) One reason he left Quito was concern about the safety of his family (gh)

EQUATORIAL GUINEA R. Nacional, Bata on 15185.78 at 1055-1638* on a Monday with some live outdoor event, mentioning 5005 frequency (Jay Novello, NC)

ETHIOPIA R. Ethiopia is on 9704.2 with home service from 0300, weak but fair after 0400 until 0600 when Niger comes on 9705.00 a bit stronger heard all day, Ethiopia sporadically such as around 1200 (Vladimir Titarev, Ukraine, DSWCI *DX Window*) Also Libya has test tone on 9705 at 0700-0930 (Wolfgang Büschel, *BC-DX*)

[non] V. of Oromo Liberation via Ukraine on new 9490 ex-9925 at 1705-1755*, nice music but co-channel VOR in Italian (Finn Krone, Denmark, DSWCI *DX Window*) Mon/Wed/Sat (Hans Johnson, *DXing with Cumbre*)

ČESKÝ ROZHLAS



FRANCE R. Nostalgie-Neige, NBFM on 25900 was heard again in August, first time since spring 1995, not yet on 26040 and 26070 (Lindenthal, Germany, DSWCI DX Window) *From ski resorts (gh)*

RFI finally announces E-mail address: <english.service@rfi.fr> (Mike Cooper, GA)

GERMANY Brother Stair heard at 0100-0200 on 9855 not //WWCR, WRNO; from Deutsche Telekom (George Thurman, *rec.radio.shortwave*) Also at 0400 on 9475 (Michael Rathbun, *ibid.*) *DT obviously has no taste about whom they sell time to (gh)* Test was during August mostly with tapes, not live feed (Jim Moats)

GREECE VOG from July 1 using four frequencies to NAm at 0000-0350--6260, 7450, 9420, 11645. Believe they were looking for two more channels to be used by VOA USA relays at this time and one at 2200-2350 (John Babbis)

INDIA All India Radio has a new website: <http://www.allindiariadio.org/> (Jim Frimmel, TX)

INDONESIA Lots of station info and photos appear on this new website: <http://www.qsl.net/yb0rmi> Clandestine page also resides here (Nick Grace, Indonesia, *rec.radio.shortwave*)

IRAN A large SW site at Sirjan, south central Iran, has been opened by Pres. Rafsanjani (IRNA via BBCM) Believed 10 x 500 kW and directional arrays, but despite this and another large new site near Mashhad, of a total 28 very high power transmitters per Transmitter Documentation Project, only four are heard at any one time (BBCM)

[non] The Flag of Freedom Organization, which previously operated a SW clandestine, is still quite active on Internet: <http://www.iranffo.org/> (Nick Grace, Indonesia, *Cumbre DX*)

IRAQ Baghdad, R. Iraq International, revived English Aug 11 after many months' absence, 11785 around 2230-2300 after French; bad modulation and interference, news about Saddam. Frequency also on after 0230, Arabic (gh) English time varies, one day at 2220-2235* Sounds like everything is recorded about 3 meters away from a studio mike (Daniel Atkinson, UK, *swtalk*) First appeared on 11292, then 11290, Baghdad's General Service in Arabic with ID after news at 2015 (Bob Hill, MA, via Al Quagliari, NASWA)

Iraqi News Agency radioteletype service, F1B 75 baud to Mideast on 10162.5: English daily 1000-1400; Arabic 1400-2100 daily, 0600-1000 exc Fri but during crises as early as 0400; one hour later in winter (BBCM)

IRELAND The real problem with Emerald Radio's mail being returned by the PO, which has continued, it turns out, is that a zone number of 1 is required after P.O. Box 200, Dublin (Finbarr O'Driscoll, Ireland)

ITALY AWR Forli 2.5 kW transmitter will run DX test for NAm UT Sept 28 and 29 at 0100-0300 with Wavescape episodes, special QSL, frequency TBA (Adrian Peterson, AWR) *How about 7230 as before?*

KUWAIT News bulletins from R. Kuwait are now on RealAudio: <http://www.radiokuwait.org/> (BBCM) English 1800-2100 on 11990 reformatted, starts with news (Eugene Gebreurs, RVI *Radio World*)

LAOS Only active SW are Xam Nua, Houa Phan on 4690 ex-4660 till 0000 and 1000-1100; Luang Prabang on 6975; National Service from Vientiane on 6130. External service on MW 1030 only, not announced 7145 or 7116v (Maarten van Delft, Laos, DSWCI DX Window)

LIBERIA VOA African Service interviewed someone in the management of Star FM, Monrovia, who said plans called for development of a SW relay at some future time, but not a high priority. It will happen, but not right away (B. Cooley, BC, *World of Radio*)

LIBYA Great Jamahiriya Radio, Tripoli in Arabic: 1229-1645 on 15435, 15415, 15235. Sabha Local Radio, 0745-1000v irregularly on 11815. V. of the Greater Arab Homeland, external service in Arabic: 1645-0400 and 1045-1230 on 15430, 15230; 15415 at 1800-0400, 1045-1230. At 1600-1745 15415 carries *Green Book* readings in Russian, German, Hungarian, Polish, Bulgarian, Czech/Slovak, Romanian, Serbo-Croat, each on a certain 2, 3 or 4 days of each month, except for Russian on 7 days (BBCM) see also ETHIOPIA

LITHUANIA R. Vilnius now on RealAudio including English 1900-1930, 2130-2200, at <http://www.lrtv.lt/lrt1.ramor> by pointing an RA player to <pmr://lrtv.lt/lrt1.ra> (Sigitas Zilionis, Lithuania) 9710 and MW 666 cause a mixing product on 10376 with audio from 666 (Andreas Erbe, Germany via Kai Ludwig) Also on 9044 (Wolfgang Büschel, BC-DX)

MADAGASCAR A private station with an address in Tana is Tsioka Vao, on 6075 at 0300-1900 in Malagasy and French with pop music. Director is a Malagasy, Detkou Dedonnais (Vaghjee, NASWA *Listeners Notebook*) Later: 0300-1900 on 6075, then another frequency evenings. Many private and religious FM stations in Madagascar test on SW occasionally. Music heard on 5950 was first thought to be another one (Vaghjee, *Cumbre DX*)

MALI As of mid-August, CRI relays in English at 0000, 0300 had been missing for a month on 9710, 11695v, nor heard on previous frequencies 9770, 9780, 11715, 11760 (Ivan Grishin, gh) Also heard on 11770v at 0000 (BBCM) *Not here (gh)*

MARITIUS MBC is not on SW in spite of last month's 9710 report, per Mr Pather, C.E. (Mahendra Vaghjee, *Cumbre DX*)

MÉXICO XERTA began testing at 2300 Aug 12 on 4800, all night with music and IDs, less than 2 kW (Héctor García B., DF) Heard the following night with open carrier

on 4800.7, but the night after that, 0405 with music and many different IDs in Spanish, one claiming 50 kW ERP, another that it's in Spanish, English, and French. 0505-0535 English program about Baja California; also when checked after 1155 with classical music. Bad het when the Guatemalan is on 4800.2, but separable on USB and R. Transcontinental de América is a bit stronger. But missing the next days (gh, OK) Homemade transmitter: plans to make another for 15120 daytime; also authorized 6110, 9750, 11720, 17720, 17880, 21460, 25620; plans to have DX programs. reports welcome to A.P. 653, 06002 México, DF (Jeff White, *Cumbre DX*)

R. Educación plans to increase power to 50 kW by November. New DX program in Spanish is *Comunicación 6185* per August sked: Wed 0200, Thu 0500, Fri 0600, Sat 0800, Sun 1000 (Héctor García B., DF, *World of Radio*) Blocked by DW and others except on the Sunday time, maybe Saturday, but other programs were heard UT Wed and Thu at 0200 (gh)

Radio Ibero will transmit its programs via XEJN R. Huayacocotla, 2390, from Aug 24. XHUIB is on 90.9 FM with 100 watts, only audible near the Universidad Iberoamericana campus in Santa Fé, D.F. (Héctor García B., *World of Radio*) Several hours a day of program exchange; both are affiliated with Jesuits (Jeff White, DSWCI DX Window) UIB has long provided R. Huaya a website, full of info on its troubles with authorities and closedown in Oct 1995, but nothing yet about this relay. Watch out for possible Guatemalan, La Voz de Atitlán, also on 2390; during Sept and Oct WWCR planned to use 2390 from 0300 to 1200 (gh) Both heard in mid-August. Huaya on 2389.95 at 0100-0155, Atitlán on 2390.02; one signed off at 0230* (Bob Wilkner, FL, DSWCI DX Window) As soon as WWCR closed at 1201, 2390 had Mexican anthem, mention of Huayacocotla (gh, OK)

R. México Int'l hopes to have another transmitter on the air in the next few months, so it can broadcast English and Spanish simultaneously (Juan Mort via Jeff White, DSWCI DX Window) Check new website: <http://www.telecommex.com/imer> (XERMX Mail Box)

MONGOLIA R. Free Asia via Ulan Bator: 0030-0130 Burmese 11580; 1530-1630 Korean 5855; 2200-2300 Korean 7470 or 7460; 2330-0030 Vietnamese 11580 (Nikolay Rudnev, Russia, NASWA *Listeners Notebook*)

MOZAMBIQUE R. Mozambique, 11812.2-11812.4v is regularly heard in 1100-1530v period, including English at 1100-1129. Also as early as 0830 //15291.8 reactivated, heard until 1205 (Mikhail Timofeyev, NERRS, Russia, DSWCI DX Window)

MYANMAR [non] Democratic Voice of Burma, from Oslo in Burmese, also Shan, Karen, Kayan, 1430-1455 daily via Norway on 11850; now also 1245-1345 daily via Germany on 15330. URL: <http://www.communique.no/dvb> (BBCM) Also via RealAudio here (Andreas Erbe, BC-DX) Aborted plans to broadcast via Vladivostok or Tashkent, unsatisfactory (DVOB via DSWCI DX Window)

NEW ZEALAND RNZI not likely to be on web audio soon, but domestic RNZ is: www.rnz.co.nz/ (RNZI Mailbox) For Sept a new RNZI frequency is 9875 at 1850-2050 (Adrian Sainsbury, RNZI)

R. Jemima, which took over the pirate SW transmitter of Kiwi R., changed name to Radio RJK as of Sept 6 (*Kiwi Radio Weekly*)

NIGER See ETHIOPIA

NIGERIA [non] V. of Free Nigeria, Sat 1900-2000 on 11680 is not from Tunisia but no comment on Algeria. Plans include daily transmissions and eventually 24h, but at least a year away. Indianapolis address is because that is where the Secretariat-General of the Free Nigeria Movement is living (Mukhtat Dan'lyan, FNM via Hans Johnson, *Cumbre DX*) Algeria is most likely due to heading and Algerian programming heard on almost the same frequency, 11679.75 until 1901 (Chris Greenway, BBCM) Printed sked valid until 05 Sept for R. Algeria Int'l shows only four frequencies, including new "11750" 50 kW at 1000-1900 to extreme south of Algeria with French network 3, just right for this service during the following hour (gh)

R. NADECO via WWCR changed repeat time M-F to 1945-2000 on 15685, still 0500-0515 on 5070 (gh)

OMAN R. Sultanate of Oman has begun transmitting via Internet, full output at 0200-2130 with 28.8 kbps modems in RealAudio. Also has full feed of TV program at

DX Listening Digest

More broadcasting information by country compiled
by Glenn Hauser

Review of International Broadcasting

SW Programming, opinion, equipment, satellite monitoring.

Samples \$2.50 each (outside North America US \$3 or 6 IRCs)

10 issue subscriptions \$26 in USA, or both for \$49

Glenn Hauser, Box 1684-MT, Enid, OK 73702

same time, all in Arabic, but considering adding English depending on listener input:

<http://www.oman-tv.gov.om> Top of hour ID *Idha'atu Saltanat Oman* is immediately followed by Big Ben-like chimes (Phillip Dampier, NY)

PAKISTAN R. Pak slow English news at 1100-1120 on new 15520//17865 which was stronger (Erik Koie, Denmark, *BC-DX*) R. Pakistan is inviting listeners abroad to suggest ways to improve programming. The best listener will get first prize of two free return air tickets to visit Pakistan, including stay in the country (R. Pak via BBCM)

PARAGUAY R. Nacional, 9738, has a new address: Blas Garay 241, c/o Iturbe, Asuncion (Horacio Nigro, Uruguay); J. Oscarsson, *Distance via Play-DX via The Four Winds* SW takes a break at 1800-2100. Programming is for local and regional audiences, but broadcasts in foreign languages for international audiences are being planned (José Carlos Carbal, Uruguay)

PERÚ R. Chasqui, Cusco, 6087.9, new station first heard Aug 7 at 1240-1301*, 0046-0100, 1130- with ID at 1200, 1229, *0000, fairly strong; sked seems to be 1130-1300, 0000-0200. Name means messenger in Quechua. McVicar says E-mail is: <dmuthcuz@amauta.rcp.net.pe> (Henrik Klemetz, *Dateline Bogotá* via DSWCI DX Window)

R. Ilucán, Cutervo, Cajamarca on new 5789.85 at 0135-0310* and at 1045. A week later it had moved again, to 5629.82, religious talk 0200-0230, music to 0310* (Jay Novello, NC)

R. Master on 5767.1 at 1151 is the successor to stations named Estación Soritor, R. Estelar and R. Universal (Henrik Klemetz, *Dateline Bogotá* via DSWCI DX Window)

R. Naylamp on new 5728.5 ex-5342 at 2320 and 1100 announcing 5730, where there is another Peruvian, R. Santiago (Henrik Klemetz, *Dateline Bogotá*)

RUSSIA VOR website offers 1-minute commercials to Europe for \$200; to Asia, Africa, Latin America \$250-300; long-term 15-minute weekly program for \$300 each (Warner & Chepikova, *Cumbre DX*)

V. of Russia in English via St. Petersburg site is on 7130 at 1400-1600 and 9740 at 1600-2200 until Oct 25 (Mikhail Timofeyev, *Electronic DX Press*)

Yeltsin signed a decree liquidating Radio-1 and merging Mayak and Yunost into one station called Mayak, because of funding problems (RFE/RL via Charles Crawford, *Cumbre DX*)

Sakhalin Radio, Yuzhno-Sakhalinsk, uses 11840 and LW 270 at 1800-1500 relaying Radio Russia in Russian, except for local program at 2000-2130, 0800-0840; one hour later in winter (BBCM)

Magadan Radio on 9600, 9530, 7320, 5940 and LW 234 relaying R. Russia in Russian 1730-1500; includes local program at 1900-2000, 0220-0300, 0620-0700. Radiostantsiya Tikhii Okean from Vladivostok at 0715-0800; one hour later in winter (BBCM)

Vladivostok Radio, 2nd Program on 5015, including relays of first program on LW, FM: 1800-2200, 0700-1300; one hour later in winter (BBCM)

SRI LANKA [non] IBC, the Tamil station in London tested unsuccessfully via Tajikistan in May, but was going to try Georgia on 15075 at 1330-1430 (Victor Goonetilleke, Sri Lanka, RNMM) ID as IBC Tamil at 1403, 1425, heard at 1355-1440* (Ed Rausch, NJ, *Cumbre DX*)

SWEDEN R. Sweden heard saying that three foreign languages would probably disappear, but keep English and German (Charles Stegall, NC)

TAHITI On a visit here in July, I found that the RFO offices had moved from downtown Papete toward the Faaa airport on a mountainside. A large beam antenna pointed up the Society Is chain was spotted at another location just west of the airport. In this area 15167v registered only strength 3 out of 5 on my YB-400. I was referred to Emile Jordan of RFO who said it was about 5 kW on 15170 and they were waiting or hoping to hear from RFO HQ about a new transmitter (Pete Costello, Tahiti) After this, fair carrier, hum, almost no audio on 15167.46 around 0305 (Randy Stewart, MO)

TATARSTAN R. Tatarstan, Kazan, has a new daily service at 0800-0900 on 9690 in Tatar except for Russian news at 0813-0819 and weather at 0856-0857 (BBCM) Beamed toward St. Petersburg, NW Russia (Mikhail Timofeyev, Russia, DSWCI DX Window) Also 0400-0500 on 9690, 0600-0700 on 6130, all via Samara (Timofeyev via Kenny, *BDXC*)

TIBET [non] V. of Tibet planned to add a morning service at 2230-2300 on 7120 (Victor Goonetilleke, Sri Lanka, RNMM)

TONGA TBC returned to SW 5030 in early June with all-night broadcasts but ceased in mid-June as Cyclone Hina took out antennas and satellite link. The latter was awaiting repair by BBC technicians from Australia. TBC was anxious to return to SW, per Dep Gen Mgr Mgalu Susimalohi (Rich Hankison, *Cumbre DX*)

TURKEY V. of Turkey has an essay contest on Anatolia as "The Cradle of Civilization." Winners get a one-week trip for two to Turkey. More info from VOT, P.O. Box 333, 06443 Yenisehir, Ankara (RVI *Radio World* via Steven Cline)

Turkish Police Radio, Ankara, 0450-1600 on 7370, may be extended on occasion, mainly music. Mainly music with weather on the hour is Voice of Meteorology, Ankara, on 6900 at 0400-0850, 1100-1545, both one hour later in winter (BBCM)

UKOGBANI BBC is spending \$25M on reorganizing 42 international news bureaus and establishing seven regional hubs: Brussels, Moscow, Delhi, Johannesburg, Washington, Jerusalem, and Hong Kong (Reuters via Hans van den Boogert, *hard-core-dx*) *Pause for Thought* features alternatives such as Humanism, Bahai'i, non-religious speakers on Wednesdays such as 1925 on 12095 (*Write On*, gh)

UKRAINE Trx to tip in *BC-DX*, RUI's DX program formerly on Wed now confirmed on Sat around 2130 on 12040, Sun 0030 on 7150, sometimes same program on consecutive weeks, once called *Radio Page for DXers*, then *Whole World on the Radio Scale* but mostly about Ukraine stations (gh)

URUGUAY SODRE, reactivated on 9621 at 0950-0300 with about 250 watts, halfwave dipole, simulcasting MW 1050. *Radioactividades* is Sat and Sun 1400-1500; report to Casilla 7011, Montevideo, or E-mail <radioact@chasque.apc.org> (Horacio Nigro)

USA R. Free Asia's seventh language, Lao, was to start August 18: 2200-2300 on 5930, 9940, 9975; 1130-1230 on 9905, 15170, 17810. That leaves Cambodian still to be implemented per the original mandate (*World of Radio*) See also ALASKA, MONGOLIA (gh) Uighur nationalists met with State Department and VOA in Washington about beginning Uighur language broadcasts to the Xinjiang-Uighur Autonomous Region of China. VOA said it and RFA are considering this (*Golos Vostochnova Turkestana*, Kazakhstan via BBCM)

Chuck Harder, in his *For the People* magazine received August 6, says "A 'monster' 50,000 watt Continental 317-C-2 radio transmitter has been purchased and will soon arrive at a 39-acre site near Lake City, Florida. There the SW station will be built as well as a repeater for WFVR 910 AM, Valdosta GA. The new SW will beam our program to the East Coast during prime time and will be repeated three hours later for the West Coast." Also says he hopes to continue present sked on WHRI, WWCR. SW station would be owned by American Community Oriented Radio Network, ACORN, affiliated with Harder. It also owns WFVR and WNTF 1580 Bithlo FL. Says ACORN will also make SW radios (Joel Hermann, IA, *World of Radio*)

WVHA, which took the town of Greenbush to court to get tax-exempt status, has been shut down after failing to pay its bills (*News from Every State, USA Today* via Malcolm Kaufman) All transmissions ceased July 16; Bangor Hydro-Electric disconnected electricity even to tower lights July 18; finance company took over July 31; employees terminated and security company contracted to secure site Aug 4 (*rec.radio.shortwave*) Finova says it would like to sell WVHA intact, but if that's not possible it will be sold in pieces. The facility would be great for reaching mariners in the Atlantic to do a request show (Kim Elliott, VOA *Communications World*) Church's mailing list numbers 10,000; WVHA had been on the market for over a sesquicentury (Dawn Gagnon, *Central Maine Morning Sentinel* via James Bean, and AP via *Portland Press Herald* via Edouard Provencher)

WSHB and KHBI website has been moved to The Mother Church's: <http://www.tfcsc.com> (C. Ed Evans, WSHB) *They sure took forever to publish their language schedule, not that it really matters any more (gh)*

FCC database says control of WRNO has involuntarily changed from the late Joe Costello to Ashton R. Hardy, co-executor—a rep of creditors? (Harry Helms, *DXKing.com*)

Another Florida NBFM is on 26350 at 1725-1830+ during sporadic E, in Spanish, mentions WSCV TV 51 Telemundo, but seems to be radio program, not TV audio (Charles Crawford, KY, *Cumbre DX*)

WORLD OF RADIO on WGTG, UT Tue 0400 on 5085-USB, may get additional unscheduled airings if the tape arrives before Monday, such as UT Mon 0515 on 5085-USB, or possibly during the day Sat/Sun on 9400. Changes on WWCR: Sat 0530 and 0605 broadcasts replaced by 0600 on 3210, 5070; Sun 2330 replaced by Mon 0300 on 3215. Remember *WOR* on WGTG, WWCR and much other SW programming shifts one UT hour later from Oct 26, also winter freq shifts (gh) See *WOR* sked and more on www.grove.net/~ghauser/

[non] Yesterday-USA Satellite Radio Network soon will add a very large SW transmitter, which will serve the world as the WWW is already doing (Tom Heathwood, YUSARN, *Radio World*) Presumably refers to the *Electra* project; I didn't think it was 'very large' (gh) On Howard Stern show, Allan Weiner said the tug *Electra* is being outfitted at a shipyard in Boston, ready to set sail by end of summer to Caribbean (*PiPA*)

Eternal Word TV Network of Mother Angelica has been denied permission to be carried on Canadian cable and satellite. The CRTC ruling came after objections such as this from outspoken Toronto Catholic Joanna Manning: "Those of other faiths or whose consciences may differ from the doctrinaire interpretations of morality offered by Mother Angelica are treated with contempt and often outright hostility..." (Leslie Scrivener, Toronto *Star* via Ivan Grishin, Mike Cooper)

UZBEKISTAN R. Tashkent

in English: As 0100 on 9715, 9530, 9375, 7190; 1200 & 1330 on 15295; 9715, 7285.

7190; Eu 2030 & 2130 on 9545, 9540 (BBCM)

Until the Next, Best of DX and 73 de Glenn!



RADIO TASHKENT

49 Khorzum Street, Tashkent, Uzbekistan
Tel: (3712) 33-38-94 Fax: 33-60468

Broadcast Loggings

Gayle Van Horn



GLOBAL FORUM

0000 UTC on 6975

CHINA: Nei Mongol PBS (tentative). Fair heterodyne but very, very weak audio to 0020. (Lee Silvi, Mentor, OH/via email) China's **CPBS** heard in Chinese on 9080 at 1325. (Zacharias Liangas, Thessaloniki, Greece).

0000 UTC on 7430

UZBEKISTAN: Trans World Radio. Tentative ID for gospel talk and music to subcontinental language. Station has "USSR" test tones, then 12-note interval signal, theme music and sign-on. (Bob Hill, Littleton, MA/*DX Report/The Four Winds*).

0029 UTC on 15395

THAILAND: Radio Thailand. English to North America with Thai culture program. Signal fade out by 0120. (Silvi, OH)

0050 UTC on 6010

ITALY: RAI. News item on child abuse laws, // 9675, 11880. (Bob Fraser, Cohasset, MA; Silvi, OH).

0138 UTC on 5960

CANADA: Radio Japan relay. Discussion on interval signals to the history of Buddhism, //9750. (Brian Boulden, Fairfield, CA/via email).

0215 UTC on 4800

GUATEMALA: Radio Buenas Nuevas. Spanish religious text, no sign of Radio Lesotho tonight. Station IDs and jingles. (Sam Wright, Biloxi, MS)

0230 UTC on 15168

TAHITI: RFO Tahiti. Very weak signal quality nightly for island music and French/Tahitian talk. Nightly checks usually audible to around 0300, some, however, only a heterodyne. (Silvi, OH)

0309 UTC on 5009.53

MADAGASCAR: RTV Malagasy. Presumed French service with fair to poor signal quality. Pop song to jingle and lady's mention of Madagascar. (Giovanni Serra, Rome, Italy/*The Four Winds*). RTV noted on 5009 at 1830 in presumed Malagasy. Music and features to national anthem at 1903. (Mark Veldhuis, Borne, Netherlands/*Hard Core DX*).

0315 UTC on 15115

NEW ZEALAND: Radio New Zealand. Discussion on the various gardening books on the market. (Sue Wilden, Columbus, IN) Report on NZ's aid to Niue Island at 0915 on 6100. (Fraser, MA)

0412 UTC on 7485

NORWAY: Radio Norway Int'l. News item on farming to sports roundup. (Boulden, CA) English ID at 1600 on 13805 into Norwegian service. (Wilden, IN) RNI noted at 2312 on 9965 in English. (Fraser, MA)

0458 UTC on 4919

ECUADOR: Radio Quito. American tunes in Spanish with good reception. Three time pips at 0500 to station promotional and commercials. (Boulden, CA; Serra, Italy/*TFW*).

0600 UTC on 4815

BURKINA FASO: Radio Burkina. Domestic service in French. Various music selections and "canned" ID and promos. (Steve Keithley, NM/*Cumbre DX*).

0602 UTC on 5076.7

COLOMBIA: Caracol. Spanish programming including ID with commercial jingles. RTTY interference in USB, occasional Morse-code interference. (Veldhuis, NLD/*Hard Core DX*).

0738 UTC on 4985

BRAZIL: Radio Brazil Central. Portuguese. Latin American music and chat for poor reception. Station ID at 0903 by male, mention of capital and Brasilia items. (Dan Ziolkowski, NY/*Cumbre DX*).

0945 UTC on 9580

AUSTRALIA: Radio Australia. Report on the social life of youths in rural areas. (Fraser, MA)

0947 UTC on 6000

BRAZIL: Radio Guaiba. Portuguese. News of Brazil to music program and studio announcements. Piano version of *Midnight Special* to ID, musical promotional and time pips at the hour. (Ziolkowski, NY/*Cumbre DX*)

1040 UTC on 11715

CANADA: Radio Korea Int'l relay. *Notes on Nostalgia* on Chong Da Suk, modern composer of traditional Korean music. **Radio Japan's Canadian relay** noted on 6120 at 1135; RCI audible on 13650 at 1210; **BBC WS Canadian relay** on 9515 at 1515 with *The Four Caliphs*. (Fraser, MA)

1154 UTC on 9705

NIGER: La Voix de Sahel. Native singing to drums signal. Time check and news in French. Next day's signal was very good at 0845, heard in vernacular language to French ID at 0900. Earlier check of 9705 heard 0758-0803 (Veldhuis, NLD).

1310 UTC on 6265

MALAWI: MBC. Chat in Swahili to African music and lengthy text. English religious songs to sermon format. Lady's announcement to bird sound effect

for interval signal. Time pips to station ID at 1405. (Mahendra Vaghjee, Rose Hill, Mauritius) MBC audible on 3380 at 2130 in English. (Giampiero Bernardini, Chieti, Italy/*TFW*)

1355 UTC on 2580

INDONESIA: RSPDT2 Timor. Presumed Indonesian with island style music and two mentions of Timor at 1400. (Tom Banks, Dallas, TX).

1417 UTC on 9750

MALAYSIA: Voice of Malaysia. News and information with SINPO=22432. (Liangas, GRC)

1514 UTC on 7490

USA: WJCR Upton, KY. Religious programming and letters from listeners. (Wilden, IN)

1707 UTC on 17830

ASCENSION ISLANDS: BBC WS. English service to Africa noted also on // 15400, 11860. *Focus on Africa* magazine show of current affairs. Station ID at 1721 and letterbox feature. (Serra, Italy/*TFW*).

1850 UTC on 15050

COSTA RICA: Radio for Peace Int'l. *AIDS Today* program discussing legal implications. (Wilden, IN)

1955 UTC on 9310

GEORGIA: Voice of Hope. Monitored to 2003*. Religious programming with UK address given at sign-off. (Wright, MS)

2000 UTC on 9525

INDONESIA: Voice of Indonesia. English to Europe, making it to North America with a good signal level. Slow-speaking English newscast and features, played by a couple of gamelan sounders. Numerous IDs to Indo pop music. Bassy audio, untroubled by other stations. (Jay Novello, NC/*Cumbre DX*).

2005 UTC on 7250

VATICAN STATE: Radio Vatican. Commentary on the sanctity of marriage to 2010*. Poor signal. (Fraser, MA; Sam Wright, Biloxi, MS)

2025 UTC on 2325

VL8T-Tennant Creek. Pop music to time checks, "ABC" ID, news and pop tune.//2310 (*Alice Springs*) and 2485 (*Katherine*). (Veldhuis, NLD; Vaghjee, MAU; Bernardini, Italy)

2035 UTC on 4890

PAPUA NEW GUINEA: NBC. Weak signal for easy-listening tunes and English/Pidgin text. (Veldhuis, NLD)

2120 UTC on 7250

HUNGARY: Radio Budapest. *DX Program* to IDs and frequency info // 9835. (Wright, MS)

2143 UTC on 7150

INDIA: AIR. General Overseas service with fast-paced subcontinental instruments with sitars, violins and tabla. English ID at 2200 into news // 7410 (best), 9910, 11620. (Hill, MA)

2145 UTC on 3396

ZIMBABWE: ZBC. Classic *Black Magic Women* tune by Santana, to vernaculars chat. Sign-off routine at 2200. (Bernardini, Italy).

2146 UTC on 9675

BRAZIL: Radio Cancao Nova. Talk and religious themes in Portuguese. Brazil's **Radio Difusora Amazonas** audible on 4805 at 2354. (Liangas, GRC)

2148 UTC on 3366

GHANA: GBC. Pop music from Swedish group ABBA. Talk to ID and music request segment. (Veldhuis, NLD; Liangas, GRC)

2330 UTC on 6725.6

PERU: Radio Satelite. Spanish announcement with IDs, time check and mentions of Santa Cruz. (Wright, MS)

2238 UTC on 5005

MALAYSIA: RTM Sibu. Romantic slow songs with fair signal quality. Malaysia's **RTM Kuching** on 4895, // 5005 at 2248. (Bernardini, Italy).

2347 UTC on 9630

INDONESIA: RRI Jakarta. Nice pop tunes and Indonesian text, audible to 0010. **RRI Jambi** heard on 4927 at 2350 with references to Malaysia. **RRI Ujung Pandang** on 4753 at 2217 with dangdut songs. (Liangas, GRC)

2350 UTC on 3290

GUYANA: GBC. Good signal for daily obituary report. Pop music tune to local commercials. Hindu style music to 0915 ID as "the Voice of Guyana." Monitored to 0035. (Frank Hilton, Charleston, SC)

Thanks to our contributors — Have you sent in YOUR logs?
Send to Gayle Van Horn, c/o Monitoring Times (or e-mail gayle@grove.net)
English broadcast unless otherwise noted.

Radio St. Helena Day Nears

As each October arrives, DXers eagerly await Tony Leo's special broadcast of Radio St. Helena...and this year is no exception!

Mark your calendars this month for October 26, broadcasting on 11092.5 SSB from 1900-2300 UTC.

The station website may be accessed at <http://www.sthelena.se/>. Links include tourist attractions, *The Picture Gallery* and *Discover St. Helena*, plus more. Philatelic collectors can link to the remote island's stamp collection with information on how to obtain their popular stamp service.

The History of St Helena is available as well as how the unique



broadcast began. Radio St. Helena welcomes you to their email list, too. Homepage updates and other projects are posted via email.

To subscribe, just send email to: majordomo@kajen.com with the text at the first row in the text box as: *subscribe sthelena your@emailaddress*. All letters to the St. Helena mailing list may be sent to: sthelena@kajen.com.



John Ekwall

Questions or suggestions on how to improve the mailing list should be sent to John Ekwall at: joe@sthelena.se or Lennart Deimert at: ld@sthelena.se.

BENIN

ORTB Cotonou, 4870 kHz. Full data QSL card unsigned. Received in 56 days for a taped report. Station address: Boite Postal 366, Cotonou, Benin. (Eric Bueneman, Hazelwood, MO/*The Four Winds*).

BOLIVIA

Radio Eco, 4702 kHz. San Borja QSL signed Gonzalo Espinoza Cortez-Director. Received in 270 days for a Spanish follow-up report. Station address: Correo Central, Reyes, Ballivian, Beni, Bolivia. (V. Korinek, S. Africa/TFW)

COLOMBIA

La Voz del Guaviare, 6035 kHz. Partial data card, postcard and personal letter from Luis Fernando Roman R.,-Director. Received in 56 days for a Spanish report. Station address: Carrera 22 con Calle 9, San Jose del Guaviare, Colombia. (V. Korinek, S. Africa/TFW)

ETHIOPIA

Radio Ethiopia, 7165 kHz. Full data blue logo card unsigned. Received in 90 days for an English report and one IRC. Station address: P.O. Box 654, Addis Ababa, Ethiopia. (Mahendra Vaghjee, Rose Hill, Mauritius)

GERMANY

West Coast Radio Ireland, 5910 kHz (Julich, Germany). Large partial data *Cliffs of Moher* card with form letter and schedule. Received in 6 months for an English report and two IRCs. Station address: Claremorris, County Mayo, Ireland. (Bill Wilkins, Springfield, MO)

JORDAN

Radio Jordan, 6035 kHz. Full data card with schedule included, signed by Jawad Zada. Received in 2 years, eight months. Station address: P.O. Box 909, Amman, Jordan. Full data logo card received for 11970 kHz in 62 days. A month later received the same, plus stickers and flag pennant. (Gayle VH, Brasstown, NC)

MALAWI

Malawi Broadcasting Corp., 3380 kHz. Frequency only verification on station letterhead, signed by E.K. Lungu. Received in 44 days for a taped report, self addressed envelope (used in reply), one US dollar and a local station bumper sticker. Station address: P.O. Box 30133, Chichiri House, Blantyre 3, Malawi. (Stewart, MO)

NAMIBIA

Namibian Broadcasting Corp., 3270 kHz. Full data scenery card of NBC TV Centre in Windhoek, also letter and program schedule, veri signer D. Schachtschneider-Manager. Received in 63 days for a taped follow-up report and return mint stamps (not used on reply). Station address: P.O. Box 321, Windhoek 9000, Namibia. (Randy Stewart, Springfield, MO)

NETHERLANDS ANTILLES

Radio Netherlands Bonaire relay, 6165 kHz. Full data *Media Network* card. Received in 14 months for an English report of 750th edition of *Media Network*, and two IRCs. Station address: P.O. Box 222, 1200 JG Hilversum, The Netherlands. (Wilkins, MO)

NON DIRECTIONAL BEACONS

RK-Suffolk, VA, 249 kHz. Full data prepared QSL card signed by J. Myron Helms-

NavAids Specialist. Received for an report and return mint stamps. Station address: Department of Aviation, Commonwealth of Virginia, 5702 Gulfstream Road, Sandston, VA 23150-2502. (Hank Holbrook, Dunkirk, MD).

CPC-Whiteville, NC, 227 kHz. Full data QSL letter signed by W. Williams-Maintenance Technician. Received in 42 days for an English report and one U.S. dollar. Station address: Columbus County Airport, Whiteville, NC 28472. (Sam Wright, Biloxi, MS).

SHIP TRAFFIC

S/S *Keystone Canyon* KSKF, 12487.5 kHz (Tanker). Full data prepared QSL card verified. Received in 21 days for an English utility report of SITOR traffic. Ship address: Attention: Radio Electronics Officer, c/o Keystone Shipping Co., 313 Chestnut Street, Philadelphia, PA 19106. (Steve McDonald, Mayne Bay, BC Canada).

M/V *Pacific King* 3FJN4, 12439 kHz (Bulker). Full data prepared QSL card verified. Received in 59 days for an English utility report of CW traffic. Ship address: Attention: Radio Electronics Officer, c/o Hyundai Bldg., 96, Mukyo-dong, Chung-ku, Seoul, South Korea. (McDonald, CAN).

S/T *Overseas Ohio* WJBG, 8382.5 kHz (Tanker). Full data prepared QSL card verified. Received in 22 days for an English utility report of SITOR traffic. Ship address: Attention: Radio Electronics Officer, c/o Second Shipmor Association, Maritime Overseas Corp., 511 Fifth Avenue, New York, NY 10017. (McDonald, CAN).

S/T *Overseas Alaska* WEHV, 4077 kHz (Tanker). Full data prepared QSL card verified. Received in 32 days for an English utility report of SITOR traffic. Ship address: Attention: Radio Electronics Officer, c/o Intercontinental Bulktaek Corp., 511 Fifth Avenue, New York, NY 10017. (McDonald, CAN).

TRAVELERS INFORMATION STATION (TIS)

WQO-767, Dallas-Ft. Worth International Airport, 1640/1680 kHz. Full data QSL folder card signed by Joc Blair-Communications Administrator, Airport Maintenance/Communications. Received in 37 days for an English report and return mint stamps. Station address: P.O. Drawer 619428, DFW Airport, TX 75261-9428. (Stewart, MO)

WNVY-508, Landover, MD, 530 kHz. Full data QSL letter signed by David Buck-Public Affairs. Received for an English report and return mint stamps. Station address: Maryland Department of Transportation, 707 Calvert Street, Baltimore, MD 21202. (Holbrook, MD)

WQC-Camel Church, VA, 884 kHz. Full data prepared QSL card verified. Received for an English report and return mint stamps. Station address: Commonwealth of Virginia, Department of Highway Transportation, 1221 East Broad Street, Richmond, VA 23219-2035. (Holbrook, MD)

WNSH-541, McDowell County, NC, 530 kHz. Full data QSL letter signed by Cindy McPeters-TDA Coordinator. Received for an English report and return mint stamps. Station address: McDowell County Tourism Development Authority, P.O. Box 1028, Marion, NC 28752. (Holbrook, MD)

YUGOSLAVIA

Radio Yugoslavia, 6100 kHz. Full data map/logo card unsigned. Received in 35 days for an English report and one IRC. Station address: P.O. Box 200, Hilandarska 2, 11000 Belgrade, Yugoslavia. (Vaghjee, MAU)

HOW TO USE THE SHORTWAVE GUIDE

1: Convert your time to UTC.

Eastern and Pacific Times are already converted to Coordinated Universal Time (UTC) at the top of each page. The rule is: convert your local time to 24-hour format; add (during Daylight Savings Time) 4, 5, 6, or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively.

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC Sunday will be heard on Saturday evening in America (8:30 pm Eastern, 5:30 pm Pacific).

2: Choose a program or station you want to hear.

Some selected programs appear on the lower half of the page for prime listening hours—space does not permit 24-hour listings.

Occasionally program listings will be followed by "See X 0000." This information indicates that the program is a rerun, and refers to a previous summary of the program's content. The letter stands for a day of the week, as indicated below, and the four digits represent a time in UTC.

S: Sunday T: Tuesday H: Thursday A: Saturday
M: Monday W: Wednesday F: Friday

3: Find the frequencies for the program or station you want to hear.

Look at the page which corresponds to the time you will be listening. Comprehensive frequency information for English broadcasts can be found at the top half of the page. All frequencies are in kHz.

The frequency listing uses the same day codes as the program listings; if a broadcast is not daily, those day codes will appear before the

station name. Irregular broadcasts are indicated "tent" and programming which includes languages besides English are coded "vi" (various languages).

4: Choose the most promising frequencies for the time, location and conditions.

Not all stations can be heard and none all the time on all frequencies. To help you find the most promising frequency, we've included information on the target area of each broadcast. Frequencies beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible. Every frequency is followed by one of these target codes:

| | | | |
|-----|-----------------|-----|--------------------|
| am: | The Americas | as: | Asia |
| na: | North America | au: | Australia |
| ca: | Central America | pa: | Pacific |
| sa: | South America | va: | various |
| eu: | Europe | do: | domestic broadcast |
| af: | Africa | om: | omnidirectional |
| me: | Middle East | | |

Consult the propagation charts. To further help you find the right frequency, we've included charts at the back of this section which take into account conditions affecting the audibility of shortwave broadcasts. Simply pick out the region in which you live and find the chart for the region in which the station you want to hear is located. The chart indicates the optimum frequencies for a given time in UTC.

HOT NEWS

BY JIM FRIMMEL

Goodbye DST. October is the month we revert to standard time. Thanks to new rules in Europe last year, North America, Central Europe, and the UK all change back the last Sunday of October (the 27th). When referring to our centerfold frequency guide, be sure to keep this fact in mind during the last five days of the month. Not all broadcasters time shift; but, in case you have trouble tuning in a station at a listed time, check one hour later than shown.

According to the Royal Greenwich Observatory, the idea of Daylight Saving Time was first suggested in a whimsical article by Benjamin Franklin in 1784, although implementation first occurred in England during World War I.

National Institute of Standards and Technology. While we're on the subject of time, here's an update on the activities of NIST (formerly known as The National Bureau of Standards) in Boulder, Colorado.

If you are fortunate enough to visit in person, you can take advantage of the free public tour of the Boulder Labs of the Department of Commerce, including the

National Institute of Standards and Technology (NIST) and National Oceanic and Atmospheric Administration (NOAA) laboratories. The 1-1/2 to 2 hour tours are held all year on Thursdays at 1:30 p.m. Additional guided tours are provided during the summer from Memorial Day to Labor Day on Tuesdays at 10:30 a.m. Or, you can take a self-guided tour any weekday from 8:00 a.m. to 5:00 p.m.

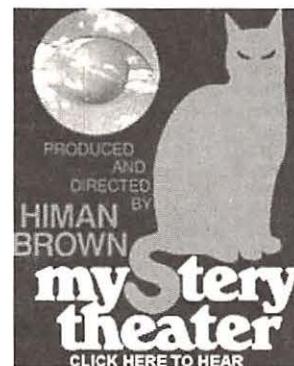
Each guided tour consists of a video presentation, a cryogenics (low-temperature physics) demonstration, and visits to the NOAA Solar Forecast Center, the NIST national standard atomic clock, and a working research lab.

If you have internet access, visit the NIST web site (www.boulder.nist.gov) for an online tour and additional information.

Take a Virtual Reality Tour of Radio Station WWV. While you're at the NIST web site described above, be sure to visit WWV's web pages off the main site. WWV broadcasts the time and frequency standards from Fort Collins, CO, that are widely used by the general public. You'll need the QuickTime VR plug-in for your web browser to view the virtual reality movies of

the various indoor and outdoor scenes. These are interactive videos: You can float from one room to another in the studio and then pass through a doorway to go outside for a look at the exterior of the building and the antenna farm. Be aware, these files are large and take time to download.

Old-Time Radio. CBS Radio on the internet now offers Himan Brown's original Mystery Theater, the half-hour dramas made for radio to thrill its audiences. These dramas were originally produced between 1974 and 1983, so, to old-time radio buffs, may not actually qualify as old-time radio. You can download the latest episode at



www.cbsradio.com/mystery/default.html. The site also features an interview with Himan Brown about the program.

Wind-Up Computer. The creator of the BayGen Freeplay wind-up radio made the CBS Television Evening News August 20th. British inventor Trevor Baylis had rigged one of his clockwork mechanisms to an Apple eMate 300 computer and was able to obtain several hours use out of a single wind. The eMate features an easy-to-use Newton operating system and long battery life and is a favorite with students.



Selected Programs. This month's program guide features the World Radio Network's internet relays of the transmissions of international broadcasters via network WRN-1 to North America. This is a unique listing! WRN was unable to provide one so we created our own. Remember that you can only hear these programs at these times on the internet using RealAudio (www.wrn.org).

0000 UTC

8:00 PM EDT/5:00 PM PDT

SHORTWAVE GUIDE

0100 UTC

9:00 PM EDT/6:00 PM PDT

FREQUENCIES

| | | | | | | | | | | |
|------------------|----------------------------|---------|---------|---------|---------|-----------------|----------------------------|---------|---------|---------|
| 0000-0100 | Anguilla, Caribbean Beacon | 6090am | | | | 0100-0200 | Indonesia, Voice of | 9525na | | |
| 0000-0100 | Australia, Radio | 9660pa | 12080pa | 13605pa | 13755pa | 0100-0125 | Iran, VOIRI | 6050eu | 9022eu | 9685eu |
| | | 15415as | 15510pa | 17750as | 17795pa | 0100-0200 th | Ireland, W Coast R Ireland | 9875am | | |
| 0000-0100 vl | Australia, VL8K Katherine | 5025do | | | | 0100-0110 | Italy, RAI Intl | 6010na | 9675na | 11800na |
| 0000-0100 vl | Australia, VL8T Tent Crk | 4910do | | | | 0100-0200 | Japan, R Japan/NHK World | 5960na | 11790as | 11860as |
| 0000-0015 | Cambodia, Natl Voice of | 11940as | | | | | | 13630am | 15500as | 11890na |
| 0000-0100 | Canada, CBC N Quebec Svc | 9625do | | | | | | 21610as | | |
| 0000-0100 | Canada, CFRX Toronto | 6070do | | | | 0100-0200 | Lebanon, Voice of Hope | 9960va | | |
| 0000-0100 | Canada, CFVP Calgary | 6030do | | | | 0100-0200 | Liberia, LCN/R Liberia Int | 5100do | | |
| 0000-0100 | Canada, CHNX Halifax | 6130do | | | | 0100-0200 smtwh | Malaysia, Radio | 7295do | | |
| 0000-0100 | Canada, CKZN St John's | 6160do | | | | 0100-0200 m | Malta, VO Mediterranean | 13605am | | |
| 0000-0100 | Canada, CKZU Vancouver | 6160do | | | | 0100-0125 | Netherlands, Radio | 6020na | 6165na | 9845na |
| 0000-0100 | China, China Radio Intl | 9710na | 11695na | | | 0100-0200 | Netherlands, Radio | 5905as | 7305as | 9855as |
| 0000-0004 | Croatia, Croatian Radio | 5895na | | | | 0100-0200 vl | New Zealand, R NZ Intl | 15115pa | | |
| 0000-0027 | Czech Rep, Radio Prague | 5930na | 7345na | | | 0100-0200 | Papua New Guinea, NBC | 9675do | | |
| 0000-0100 | Ecuador, HCJB | 9745am | 21455am | | | 0100-0200 | Philippines, FEBC/R Intl | 15450as | | |
| 0000-0030 | Egypt, Radio Cairo | 9900na | | | | 0100-0200 | Russia, Voice of Russia WS | 7105na | 12010na | 12050na |
| 0000-0015 vl | Ghana, Ghana Broadc Corp | 3366do | 4915do | | | | | 15180na | 15595na | 13665na |
| 0000-0045 | India, All India Radio | 7150as | 9705as | 9950as | 11620as | 0100-0130 | Slovakia, R Slovakia Intl | 5930na | | |
| 0000-0100 | Japan, R Japan/NHK World | 6155eu | 6180eu | | | 0100-0200 | Spain, R Exterior Espana | 6055am | | |
| 0000-0100 | Lebanon, Voice of Hope | 9960va | | | | 0100-0200 | Sri Lanka, Sri Lanka BC | 9730as | | |
| 0000-0100 | Liberia, LCN/R Liberia Int | 5100do | | | | 0100-0130 | Switzerland, Swiss R Intl | 6135na | 9885na | 9905ca |
| 0000-0100 | Malaysia, Radio | 7295do | | | | 0100-0200 | United Kingdom, BBC WS | 5965as | 5970sa | 5975am |
| 0000-0100 | Malaysia, RTM Kuching | 7160do | | | | | | 6145am | 6175am | 6195as |
| 0000-0100 | Netherlands, Radio | 6020na | 6165na | 9845na | | | | 9590am | 9605as | 11750am |
| 0000-0100 | New Zealand, R NZ Intl | 15115pa | | | | | | 15280as | 15310as | 11955as |
| 0000-0057 | North Korea, R Pyongyang | 11335na | 11845na | 13650na | 13760na | 0100-0200 | USA, KAIJ Dallas TX | 5810am | | |
| | | 15130na | 15230na | | | 0100-0200 | USA, KJES Mesquite NM | 7555na | | |
| 0000-0100 vl | Papua New Guinea, NBC | 9675do | | | | 0100-0200 | USA, KTBN Salt Lk City UT | 7510am | | |
| 0000-0100 | Russia, Voice of Russia WS | 7125na | 7250na | 7310na | 9820na | 0100-0200 | USA, KWHR Naalehu HI | 17510as | | |
| 0000-0030 mtwhfa | Serbia, R Yugoslavia | 9580na | 11870na | | | 0100-0200 | USA, Monitor Radio Intl | 7535na | | |
| 0000-0100 | Spain, R Exterior Espana | 6055am | | | | 0100-0200 | USA, Voice of America | 7115as | 7205as | 9635as |
| 0000-0030 | Thailand, Radio | 9655af | 9690af | 11905af | | 0100-0200 | | 11725as | 15170as | 11705as |
| 0000-0100 | Ukraine, R Ukraine Intl | 5905na | 6010na | 6020na | 6090na | 0100-0200 twhta | USA, Voice of America | 17820as | | 12520as |
| | | 7150na | 7180na | 7240na | 9550na | | | 5995am | 6130am | 7405am |
| | | 9560na | 12040na | | | 0100-0200 | | 13740am | | 9445am |
| 0000-0100 | United Kingdom, BBC WS | 5965as | 5970am | 5975am | 6175am | 0100-0200 | USA, WEWN Birmingham AL | 5825eu | | |
| | | 6195as | 9410as | 9590am | 9915sa | 0100-0200 | USA, WGTG McCaysville GA | 5085am | | |
| | | 11750sa | 11955as | 15310as | | 0100-0200 | USA, WHRI Noblesville IN | 5745am | | |
| 0000-0045 | United Kingdom, BBC WS | 3915as | | | | 0100-0200 | USA, WINB Red Lion PA | 11950am | | |
| 0000-0030 | United Kingdom, BBC WS | 7110as | 9580as | 11945as | 15280as | 0100-0200 | USA, WJCR Upton KY | 7490na | | |
| 0000-0100 | USA, KAIJ Dallas TX | 5810am | | | | 0100-0200 | USA, WRMI/R Miami Intl | 9955am | | |
| 0000-0100 | USA, KTBN Salt Lk City UT | 15590am | | | | 0100-0200 | USA, WRNO New Orleans LA | 7355am | | |
| 0000-0100 | USA, KWHR Naalehu HI | 17510as | | | | 0100-0200 | USA, WWCR Nashville TN | 3215am | 5070am | 7435am |
| 0000-0100 | USA, Monitor Radio Intl | 7535am | 9430sa | 15665as | | 0100-0200 | USA, WYFR Okeechobee FL | 6065na | 9505na | 11550as |
| 0000-0100 | USA, Voice of America | 7215as | 9770as | 11760as | 15185as | 0100-0130 | Uzbekistan, R Tashkent | 7190eu | 9375eu | 9530eu |
| 0000-0100 twhta | USA, Voice of America | 5995am | 6130am | 7395am | 7405am | 0100-0126 | Vietnam, Voice of | 7240na | | |
| | | 9455am | 9775am | 11695am | 13740am | 0130-0150 | Greece, Voice of | 6260na | 7450na | 9420na |
| 0000-0100 | USA, WEWN Birmingham AL | 5825eu | | | | 0130-0200 | Netherlands, Radio | 5905as | 9855as | 11645na |
| 0000-0100 | USA, WGTG McCaysville GA | 5085am | | | | 0130-0200 | Slovakia, AWR Europe | 9465eu | | |
| 0000-0100 | USA, WHRI Noblesville IN | 5745am | | | | 0130-0200 | Sweden, Radio | 9435as | | |
| 0000-0100 | USA, WINB Red Lion PA | 11950am | | | | 0130-0200 s | Sweden, Radio | 7290am | | |
| 0000-0100 | USA, WJCR Upton KY | 7490na | | | | 0140-0159 | Vatican State, Vatican R | 5980as | 7335as | |
| 0000-0100 | USA, WRMI/R Miami Intl | 9955am | | | | 0145-0200 | Albania, R Tirana Intl | 6115na | | |
| 0000-0100 | USA, WRNO New Orleans LA | 7355am | | | | 0200-0300 | Anguilla, Caribbean Beacon | 6090am | | |
| 0000-0100 | USA, WWCR Nashville TN | 3215am | 5070am | 7435am | 13845am | 0200-0300 twhta | Argentina, RAE | 11710am | | |
| 0000-0100 | USA, WYFR Okeechobee FL | 6085na | 9505ca | | | 0200-0300 | Australia, Radio | 9660pa | 12080pa | 13605pa |
| 0030-0055 | Austria, R Austria Intl | 9655na | | | | 0200-0300 | | 13750pa | | 15240pa |
| 0030-0100 | Iran, VOIRI | 6050eu | 9022eu | 9685eu | | 0200-0300 vl | Australia, VL8K Katherine | 5025do | | |
| 0030-0100 | Lithuania, Radio Vilnius | 9855na | | | | 0200-0300 vl | Australia, VL8T Tent Crk | 4910do | | |
| 0030-0100 | Netherlands, Radio | 5905as | 7305as | 9855as | 11655as | 0200-0210 | Bangladesh, Bangla Betar | 4880do | | |
| 0030-0100 | Sri Lanka, Sri Lanka BC | 9730as | | | | 0200-0300 | Canada, CBC N Quebec Svc | 9625do | | |
| 0030-0100 | Thailand, Radio | 9655va | 11905va | 15395as | | 0200-0300 | Canada, CFRX Toronto | 6070do | | |
| 0035-0040 | India, All India Radio | 5010do | 7110do | 11870do | | 0200-0300 | Canada, CFVP Calgary | 6030do | | |
| 0050-0100 | Italy, RAI Intl | 6010na | 9675na | 11800na | | 0200-0300 | Canada, CHNX Halifax | 6130do | | |
| 0100-0200 | Anguilla, Caribbean Beacon | 6090am | | | | 0200-0300 | Canada, CKZN St John's | 6160do | | |
| 0100-0200 | Australia, Radio | 9660pa | 12080pa | 13605pa | 13755pa | 0200-0300 | Canada, CKZU Vancouver | 6160do | | |
| | | 15415as | 15510pa | 17750pa | 17795pa | 0200-0300 | Canada, R Canada Intl | 6120am | 9535am | 9755am |
| 0100-0200 vl | Australia, VL8K Katherine | 5025do | | | | 0200-0300 | | 11715am | 13670am | 9780am |
| 0100-0200 vl | Australia, VL8T Tent Crk | 4910do | | | | 0200-0300 | Costa Rica, RF Peace Intl | 7385am | 7585am | 15050am |
| 0100-0200 | Canada, CBC N Quebec Svc | 9625do | | | | 0200-0204 | Croatia, Croatian Radio | 5895na | | |
| 0100-0200 | Canada, CFRX Toronto | 6070do | | | | 0200-0300 | Cuba, Radio Havana | 6000na | 9820na | 9830na |
| 0100-0200 | Canada, CFVP Calgary | 6030do | | | | 0200-0300 | Ecuador, HCJB | 9745am | 21455am | |
| 0100-0200 | Canada, CHNX Halifax | 6130do | | | | 0200-0300 | Egypt, Radio Cairo | 9475na | | |
| 0100-0200 | Canada, CKZN St John's | 6160do | | | | 0200-0250 | Germany, Deutsche Welle | 7285as | 9615as | 9690as |
| 0100-0200 | Canada, CKZU Vancouver | 6160do | | | | 0200-0300 | Kenya, Kenya Broadc Corp | 4885do | 4935do | 6150do |
| 0100-0200 | Canada, R Canada Intl | 9535am | 9755am | 11715am | 13670am | 0200-0300 | Lebanon, Voice of Hope | 9960va | | |
| 0100-0200 | Costa Rica, RF Peace Intl | 7385am | 7585am | 15050am | | 0200-0300 smtwh | Malaysia, Radio | 7295do | | |
| 0100-0104 | Croatia, Croatian Radio | 5895na | | | | 0200-0300 s | Malta, VO Mediterranean | 15550au | 17570as | |
| 0100-0200 | Cuba, Radio Havana | 6000na | 9820na | 9830na | | 0200-0230 | Netherlands, Radio | 5905as | 7305as | 9855as |
| 0100-0127 | Czech Rep, Radio Prague | 6200na | 7345na | | | 0200-0300 | New Zealand, R NZ Intl | 15115pa | | |
| 0100-0200 | Ecuador, HCJB | 9745am | 21455am | | | 0200-0300 m | Norway, Radio Norway Intl | 7465na | 9560na | |
| 0100-0150 | Germany, Deutsche Welle | 6040na | 6085na | 6145na | 9640na | 0200-0300 | Papua New Guinea, NBC | 9675do | | |
| 0100-0115 | Ghana, Ghana Broadc Corp | 3366do | 4915do | | | 0200-0300 | Philippines, FEBC/R Intl | 15450as | | |
| 0100-0130 | Hungary, Radio Budapest | 6120na | 9580na | | | 0200-0256 | Romania, R Romania Intl | 5990na | 6155na | 9510na |

0200 UTC

10:00 PM EDT/7:00 PM PDT

SHORTWAVE GUIDE

0300 UTC

11:00 PM EDT/8:00 PM PDT

FREQUENCIES

| | | | | | | | | | |
|------------------|----------------------------|---------|---------|---------|-----------------|-----------------------------|---------|---------|---------|
| 0200-0300 | Russia, Voice of Russia WS | 11940na | 12990na | | 0300-0400 | Turkey, Voice of | 7270as | 7300eu | 15190au |
| | | 7105na | 12010na | 12050na | 0300-0315 mtwhf | Uganda, Radio | 4976do | | |
| | | 13665na | 15180na | 15595na | 0300-0400 | Ukraine, R Ukraine Intl | 6020na | 7150na | 9550na |
| 0200-0300 | South Korea, R Korea Intl | 7275as | 11725am | 11810am | 0300-0330 | United Kingdom, BBC WS | 5970sa | 6135af | 12040na |
| 0200-0300 | Sri Lanka, Sri Lanka BC | 9730as | | | 0300-0400 | | 15360as | | 9895am |
| 0200-0300 | Taiwan, VO Free China | 5950na | 7130as | 9680na | 0300-0400 | United Kingdom, BBC WS | 3255af | 5975am | 6005af |
| | | 11825as | 15345as | 11740ca | | | 6180eu | 6190af | 6175na |
| 0200-0300 | United Kingdom, BBC WS | 5970sa | 5975am | 6135af | 0300-0400 | USA, Monitor Radio Intl | 5850na | 7115af | 9410eu |
| | | 6195eu | 9410va | 9605as | 0300-0400 | USA, Voice of America | 6080af | 7105af | 7280af |
| | | 15280as | 15310as | 15360as | 0300-0400 | USA, KAIJ Dallas TX | 5810am | | |
| 0200-0230 | United Kingdom, BBC WS | 9590am | 9915am | | 0300-0400 | USA, KBTN Salt Lk City UT | 7510am | | |
| 0200-0300 | USA, KAIJ Dallas TX | 5810am | | | 0300-0400 | USA, KVHO Los Angeles CA | 9975am | | |
| 0200-0230 | USA, KJES Mesquite NM | 7555na | | | 0300-0400 | USA, KWHR Naalehu HI | 17510as | | |
| 0200-0300 | USA, KTBN Salt Lk City UT | 7510am | | | 0300-0400 | USA, Monitor Radio Intl | 5850na | 7115af | 7280af |
| 0200-0300 | USA, KVHO Los Angeles CA | 9975am | | | 0300-0400 | USA, Voice of America | 6080af | 7105af | 9885am |
| 0200-0300 | USA, KWHR Naalehu HI | 17510as | | | 0300-0330 smtwh | USA, Voice of America | 4960af | | |
| 0200-0300 | USA, Monitor Radio Intl | 7535na | | | 0300-0400 | USA, WEWN Birmingham AL | 5825eu | | |
| 0200-0300 | USA, Voice of America | 7115as | 7205as | 9635as | 0300-0400 | USA, WGTG McCaysville GA | 5085am | | |
| | | 11725as | 15170as | 15250as | 0300-0400 | USA, WHRI Noblesville IN | 5745am | 7315am | |
| 0200-0300 | USA, WEWN Birmingham AL | 5825eu | | | 0300-0400 | USA, WINB Red Lion PA | 11950am | | |
| 0200-0300 | USA, WGTG McCaysville GA | 5085am | | | 0300-0400 | USA, WJCR Upton KY | 7490na | | |
| 0200-0300 | USA, WHRI Noblesville IN | 5745am | 7315am | | 0300-0400 | USA, WRMI/R Miami Intl | 9955am | | |
| 0200-0300 | USA, WINB Red Lion PA | 11950am | | | 0300-0400 | USA, WRNO New Orleans LA | 7395am | | |
| 0200-0300 | USA, WJCR Upton KY | 7490na | | | 0300-0400 | USA, WWCR Nashville TN | 3215am | 5070am | 5935am |
| 0200-0300 | USA, WRMI/R Miami Intl | 9955am | | | 0300-0400 | USA, WYFR Okeechobee FL | 6065na | 9505na | 7435am |
| 0200-0300 | USA, WRNO New Orleans LA | 7355am | | | 0300-0310 | Vatican State, Vatican R | 7305na | | |
| 0200-0300 | USA, WWCR Nashville TN | 3215am | 5070am | 5935am | 0300-0400 vl | Zambia, R Zambia/ZNBC 1 | 4910do | | |
| 0200-0300 | USA, WYFR Okeechobee FL | 6065na | 9505na | | 0300-0400 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | |
| 0215-0225 | Nepal, Radio | 5005do | 7165do | | 0300-0400 vl | Zimbabwe, Zimbabwe BC | 3396do | | |
| 0230-0300 | Albania, R Tirana Intl | 6140na | 7160na | | 0310-0340 | Vatican State, Vatican R | 7360af | 9660af | |
| 0230-0259 | Austria, R Austria Intl | 9655na | 9870sa | 13730sa | 0330-0357 | Czech Rep, Radio Prague | 9480me | 11600as | |
| 0230-0300 | Hungary, Radio Budapest | 9840na | 11910na | | 0330-0355 | Moldova, R Moldova Intl | 7520na | | |
| 0230-0300 | Netherlands, Radio | 9855as | 11655as | | 0330-0400 vl | Philippines, R Pilipinas | 7730as | 13770as | 15330as |
| 0230-0245 | Pakistan, Radio | 7255as | 7270as | 15120as | 0330-0400 twhfa | Portugal, R Portugal Intl | 6150am | 9570am | |
| 0230-0300 vl/m-a | Philippines, R Pilipinas | 11885me | 15120me | 15270me | 0330-0400 | Slovakia, AWR Europe | 11610as | | |
| 0230-0300 | Sweden, Radio | 7135na | | | 0330-0400 | Sweden, Radio | 9430na | | |
| 0230-0300 | United Kingdom, BBC WS | 7325am | 9895am | | 0330-0400 | Tanzania, Radio | 5050af | | |
| 0230-0256 | Vietnam, Voice of | 7250na | | | 0330-0400 | United Kingdom, BBC WS | 9610af | 11730af | 11955as |
| 0230-0300 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | | 0333-0400 mtwhf | Swaziland, Trans World R | 7215af | | |
| 0245-0300 | India, All India Radio | 6045do | 7110do | 11830do | 0335-0355 vl | India, All India Radio | 7110do | 11830do | 15135do |
| 0250-0300 sf | Greece, Voice of | 6260na | 7450na | 9420na | 0340-0350 | Greece, Voice of | 6260na | 7450na | 9420na |
| 0250-0300 | Vatican State, Vatican R | 7305am | 9605am | | 0345-0400 | Burundi, Radio Nationale | 6140do | | 11645na |
| 0255-0300 vl | Zambia, R Zambia/ZNBC 1 | 4910do | | | 0345-0400 as | Tajikistan, Radio Dushanbe | 7245as | 9905as | 11620as |
| 0300-0400 | Anguilla, Caribbean Beacon | 6090am | | | 0345-0400 as | Uganda, Radio | 4976do | | |
| 0300-0400 | Australia, Radio | 9660pa | 12080pa | 13605pa | 0356-0400 | Zambia, Christian Voice | 3330af | 6065af | |
| | | 15365pa | 15415as | 17750pa | 0400-0500 | Anguilla, Caribbean Beacon | 6090am | | |
| 0300-0400 | Australia, VL8K Katherine | 5025do | | | 0400-0500 | Australia, Radio | 9660pa | 12080pa | 13605as |
| 0300-0400 vl | Australia, VL8T Tent Crk | 4910do | | | 0400-0500 s | Australia, Radio | 15510pa | 17795pa | |
| 0300-0400 vl | Canada, CBC N Quebec Svc | 9625do | | | 0400-0500 vl | Australia, VL8K Katherine | 15415as | 17750as | |
| 0300-0400 | Canada, CFRX Toronto | 6070do | | | 0400-0500 vl | Australia, VL8T Tent Crk | 5025do | | |
| 0300-0400 | Canada, CFVP Calgary | 6030do | | | 0400-0500 | Australia, Defense Forces R | 4910do | | |
| 0300-0400 | Canada, CHNX Halifax | 6130do | | | 0400-0500 | Bulgaria, Radio | 9485na | 11720na | |
| 0300-0400 | Canada, CKZN St John's | 6160do | | | 0400-0500 | Canada, CBC N Quebec Svc | 9625do | | |
| 0300-0400 | Canada, CKZU Vancouver | 6160do | | | 0400-0500 | Canada, CFRX Toronto | 6070do | | |
| 0300-0400 | China, China Radio Intl | 9690na | 9710na | | 0400-0500 | Canada, CFVP Calgary | 6030do | | |
| 0300-0400 vl | Costa Rica, Faro del Carib | 5055do | | | 0400-0500 | Canada, CHNX Halifax | 6130do | | |
| 0300-0400 | Costa Rica, RF Peace Intl | 7385am | 7585am | 15050am | 0400-0500 | Canada, CKZN St John's | 6160do | | |
| 0300-0304 | Croatia, Croatian Radio | 5895na | 9495na | | 0400-0500 | Canada, CKZU Vancouver | 6160do | | |
| 0300-0400 | Cuba, Radio Havana | 6000na | 9820na | 9830na | 0400-0430 | Canada, R Canada Intl | 9715me | 11835me | 15275me |
| 0300-0327 | Czech Rep, Radio Prague | 5930as | 7345as | | 0400-0500 | China, China Radio Intl | 9560na | 9730am | |
| 0300-0400 | Ecuador, HCJB | 9745am | 21455am | | 0400-0500 | Costa Rica, RF Peace Intl | 7385am | 7585am | 15050am |
| 0300-0330 | Egypt, Radio Cairo | 9475na | | | 0400-0404 | Croatia, Croatian Radio | 5895na | 5920na | 9495na |
| 0300-0350 | Germany, Deutsche Welle | 6085na | 6185na | 9535na | 0400-0500 | Cuba, Radio Havana | 6000na | 9820na | 9830na |
| | | 9640na | | | 0400-0500 vl | Cyprus, BRT International | 6150do | | |
| 0300-0400 | Guatemala, Radio Cultural | 3300do | | | 0400-0500 | Ecuador, HCJB | 9745am | 21455am | |
| 0300-0400 m | Honduras, LV Evangelica | 4820do | | | 0400-0450 | Germany, Deutsche Welle | 5990af | 6015af | 7225af |
| 0300-0400 | Japan, R Japan/NHK World | 17685va | | | | 11765af | 9565af | | |
| 0300-0400 vl | Kenya, Kenya Broad Corp | 4885do | 4935do | 6150do | | | | | |
| 0300-0400 | Lebanon, Voice of Hope | 9960va | | | | | | | |
| 0300-0400 vl | Lesotho, Radio Lesotho | 4800do | | | | | | | |
| 0300-0400 vl | Malaysia, RTM Kuching | 7160do | | | | | | | |
| 0300-0400 s | Malta, VO Mediterranean | 15550au | 17570as | | | | | | |
| 0300-0330 mtwhf | Mexico, Radio Mexico Intl | 9705na | | | | | | | |
| 0300-0325 | Netherlands, Radio | 9855as | 11655as | | | | | | |
| 0300-0400 | New Zealand, R NZ Intl | 15115pa | | | | | | | |
| 0300-0310 | Pakistan, Radio | 7270as | | | | | | | |
| 0300-0400 vl | Papua New Guinea, NBC | 9675do | | | | | | | |
| 0300-0330 vl | Philippines, R Pilipinas | 11885as | 15120as | 15270as | | | | | |
| 0300-0400 | Russia, Voice of Russia WS | 7125na | 12000na | 12010na | 12050na | | | | |
| | | 13645na | 13665na | 15180na | 15595na | | | | |
| 0300-0330 | S Africa, Channel Africa | 5955af | | | | | | | |
| 0300-0400 | Sri Lanka, Sri Lanka BC | 9730as | | | | | | | |
| 0300-0400 | Taiwan, VO Free China | 5950na | 9680na | 11745au | 11825as | | | | |
| 0300-0330 | Thailand, Radio | 9655na | 11905na | 15395na | | | | | |

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FREQUENCIES

| | | | | | | | | | |
|------------------|----------------------------|---------|---------|-----------------|----------------------------|---------|---------|---------|---------|
| 0400-0500 twhfa | Guatemala, Radio Cultural | 3300do | | 0500-0600 | Japan, R Japan/NHK World | 6110na | 7230eu | 11840as | 11895eu |
| 0400-0500 m | Honduras, LV Evangelica | 4820do | | 0500-0530 | Japan, R Japan/NHK World | 11920na | | | |
| 0400-0415 | Israel, Kol Israel | 7465na | 9435na | 0500-0600 vl | Kenya, Kenya Broad Corp | 13630na | 15230na | | |
| 0400-0500 vl | Kenya, Kenya Broad Corp | 4885do | 4935do | 0500-0600 vl | Kiribati, Radio | 4885do | 4935do | 6150do | |
| 0400-0500 | Lebanon, Voice of Hope | 9960va | | 0500-0600 | Lebanon, Voice of Hope | 9810do | | | |
| 0400-0500 s | Malta, VO Mediterranean | 15550as | 17570au | 0500-0505 | Lesotho, Radio Lesotho | 9960va | | | |
| 0400-0430 mtwhf | Mexico, Radio Mexico Intl | 9705na | | 0500-0600 | Liberia, LCN/R Liberia Int | 4800do | | | |
| 0400-0458 | New Zealand, R NZ Intl | 15115pa | | 0500-0510 mtwhf | Malawi, MBC | 5100do | | | |
| 0400-0457 | North Korea, R Pyongyang | 15180as | 15230as | 0500-0625 | Netherlands, Radio | 3380do | | | |
| 0400-0430 m | Norway, Radio Norway Intl | 7485na | | 0500-0600 | New Zealand, R NZ Intl | 6165na | 9590na | | |
| 0400-0500 vl | Papua New Guinea, NBC | 9675do | | 0500-0505 | Nigeria, FRCN/Radio | 9795pa | | | |
| 0400-0456 | Romania, R Romania Intl | 5990na | 6155na | 0500-0600 | Nigeria, Voice of | 3326do | 4770do | 4990do | |
| 0400-0500 | Russia, Voice of Russia WS | 11940na | 12990na | 0500-0557 | North Korea, R Pyongyang | 7255af | | | |
| | | 12000na | 12010na | 0500-0510 | Pakistan, Radio | 11740as | 13790as | | |
| | | 13645na | 13665na | 0500-0600 vl | Papua New Guinea, NBC | 7270as | | | |
| | | 15180na | 15445na | 0500-0600 | Russia, Voice of Russia WS | 9675do | | | |
| 0400-0430 | S Africa, Channel Africa | 5955af | | 0500-0600 | Russia, Voice of Russia WS | 12000na | 12010na | 12040na | 12050na |
| 0400-0404 mtw | S Africa, Trans World R | 7215af | | 0500-0600 | S Africa, Channel Africa | 13645na | 13665na | 15445na | 15595na |
| 0400-0430 | Slovakia, AWR Europe | 9465af | | 0500-0530 | Spain, R Exterior Espana | 9675af | | | |
| 0400-0430 | Sri Lanka, Sri Lanka BC | 9730as | | 0500-0556 | Swaziland, Trans World R | 6055am | | | |
| 0400-0404 mtwhf | Swaziland, Trans World R | 7215af | | 0500-0530 | Switzerland, Swiss R Intl | 6100af | | | |
| 0400-0430 | Switzerland, Swiss R Intl | 6135na | 9885na | 0500-0530 | Uganda, Radio | 6165eu | 9535eu | | |
| 0400-0430 | Tanzania, Radio | 5050af | | 0500-0515 | United Kingdom, BBC WS | 3255af | 3955eu | 5975am | 6005af |
| 0400-0500 | Turkey, Voice of | 7340na | | 0500-0600 | United Kingdom, BBC WS | 6175am | 6180eu | 6190af | 6195va |
| 0400-0415 | Uganda, Radio | 4976do | | 0500-0600 | United Kingdom, BBC WS | 7120va | 7160af | 9410va | 9600af |
| 0400-0500 | United Kingdom, BBC WS | 3255af | 3955eu | 0500-0600 | United Kingdom, BBC WS | 9610af | 9740as | 11760as | 11940af |
| | | 6175am | 6180eu | 0500-0600 | United Kingdom, BBC WS | 12095as | 15310as | 15360as | 15420af |
| | | 7160af | 9410na | 0500-0600 | United Kingdom, BBC WS | 15575va | 17640af | 17760as | 17885af |
| | | 9460af | 9600af | 0500-0600 | United Kingdom, BBC WS | 21660as | | | |
| 0400-0430 | United Kingdom, BBC WS | 9605as | 9610af | 0500-0600 | United Kingdom, BBC WS | 15280as | 17790as | | |
| 0400-0500 | USA, KAJ Dallas TX | 5810am | | 0500-0600 | USA, KAJ Dallas TX | 5810am | | | |
| 0400-0500 | USA, KTBN Salt Lk City UT | 7510am | | 0500-0600 | USA, KTBN Salt Lk City UT | 7510am | | | |
| 0400-0500 | USA, KVHO Los Angeles CA | 9975am | | 0500-0600 | USA, KVOH Los Angeles CA | 9975am | | | |
| 0400-0500 | USA, KWHR Naalehu HI | 17780as | | 0500-0600 | USA, KWHR Naalehu HI | 17780as | | | |
| 0400-0500 | USA, Voice of America | 6080af | 7170af | 0500-0600 | USA, Voice of America | 5970af | 6035af | 6080af | 7170va |
| | | 7290af | 9575af | 0500-0600 | USA, Voice of America | 7195af | 9630af | 11965me | 12080af |
| | | 9575af | 9885af | 0500-0600 | USA, Voice of America | 13740af | 15205va | | |
| 0400-0500 | USA, WEWN Birmingham AL | 5825eu | | 0500-0600 | USA, WGTG McCaysville GA | 5085am | | | |
| 0400-0500 | USA, WGTG McCaysville GA | 5085am | | 0500-0600 | USA, WHRI Noblesville IN | 5745am | 7315am | | |
| 0400-0500 | USA, WHRI Noblesville IN | 5745am | | 0500-0600 | USA, WINB Red Lion PA | 11950am | | | |
| 0400-0500 | USA, WINB Red Lion PA | 11950am | | 0500-0600 | USA, WJCR Upton KY | 7490na | | | |
| 0400-0500 | USA, WJCR Upton KY | 7490na | | 0500-0600 | USA, WMLK Bethel PA | 9465eu | | | |
| 0400-0500 smtwhf | USA, WMLK Bethel PA | 9465eu | | 0500-0600 | USA, WRMI/R Miami Intl | 9955am | | | |
| 0400-0500 | USA, WRMI/R Miami Intl | 9955am | | 0500-0600 | USA, WRNO New Orleans LA | 7395am | | | |
| 0400-0500 | USA, WWNO New Orleans LA | 7395am | | 0500-0600 | USA, WWCR Nashville TN | 3210am | 5070am | 5935am | 7435am |
| 0400-0500 | USA, WWCR Nashville TN | 3210am | 5070am | 0500-0600 | USA, WWCR Nashville TN | 5985na | 9985af | 11580eu | |
| 0400-0500 | USA, WYFR Okeechobee FL | 6065na | 9505na | 0500-0600 | Vatican State, Vatican R | 9660af | 11625af | 15570af | |
| 0400-0430 | Vietnam, Voice of | 12020na | 15010na | 0500-0600 | Vatican State, Vatican R | 4005eu | 5882eu | 7250eu | |
| 0400-0500 | Zambia, Christian Voice | 3330af | 6065af | 0500-0600 | Zambia, Christian Voice | 3330af | 6065af | | |
| 0400-0500 vl | Zambia, R Zambia/ZNBC 1 | 4910do | | 0500-0600 | Zambia, R Zambia/ZNBC 1 | 4910do | | | |
| 0400-0500 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | 0500-0600 | Zambia, R Zambia/ZNBC 2 | 6165do | | | |
| 0400-0500 vl | Zimbabwe, Zimbabwe BC | 3396do | | 0500-0600 | Zimbabwe, Zimbabwe BC | 3396do | | | |
| 0415-0500 vl | Malawi, MBC | 5993do | | 0505-0600 | Swaziland, Trans World R | 3200af | 4775af | 9500af | |
| 0425-0440 vl | Italy, RAI Intl | 5975eu | 7270eu | 0525-0600 | Ghana, Ghana Broad Corp | 3366do | 4915do | | |
| 0425-0500 | Nigeria, FRCN/Radio | 3326do | 4770do | 0530-0559 | Austria, R Austria Intl | 6205na | | | |
| 0430-0459 | Austria, R Austria Intl | 6155eu | 13730eu | 0530-0500 vl | Italy, IRRS | 3985va | | | |
| 0430-0500 m-f/vl | Lesotho, Radio Lesotho | 4800do | | 0530-0556 | Romania, R Romania Intl | 11790af | 11940af | 15250af | 15270af |
| 0430-0455 | Moldova, R Moldova Intl | 7520na | | 0530-0600 | Thailand, Radio | 9655eu | 11905eu | 15115eu | |
| 0430-0500 | Netherlands, Radio | 6165na | 9590na | 0530-0600 vl | Zambia, R Zambia/ZNBC 1 | 7220do | | | |
| 0430-0500 | Serbia, R Yugoslavia | 9580na | 11870na | 0530-0600 vl | Zimbabwe, Zimbabwe BC | 5975do | | | |
| 0430-0500 | Swaziland, Trans World R | 3200af | 4775af | 0600-0700 | Anguilla, Caribbean Beacon | 6090am | | | |
| 0430-0500 | Switzerland, Swiss R Intl | 9905ca | | 0600-0700 | Australia, Radio | 9660pa | 11830as | 12080pa | 13605as |
| 0430-0500 | United Kingdom, BBC WS | 15420af | | 0600-0700 vl | Australia, VL8K Katherine | 15240pa | 15415as | 15510as | 17750as |
| 0455-0500 | Malaysia, Voice of | 6175as | 9750as | 0600-0700 vl | Australia, VL8T Tent Crk | 5025do | | | |
| 0459-0500 | New Zealand, R NZ Intl | 9795pa | | 0600-0700 vl | Australia, VL8T Tent Crk | 4910do | | | |
| 0500-0600 | Anguilla, Caribbean Beacon | 6090am | | 0600-0633 | Australia, DefenseForces R | 9660pa | 11830as | 12080pa | 13605as |
| 0500-0600 | Australia, Radio | 9660pa | 12080pa | 0600-0700 vl | Canada, CBC N Quebec Svc | 15240pa | 15415as | 15510as | 17750as |
| 0500-0600 vl | Australia, VL8K Katherine | 5025do | | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 vl | Australia, VL8T Tent Crk | 4910do | | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 | Australia, DefenseForces R | 13525as | | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 vl | Cameroon, Radio Cameroon | 4850do | | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 | Canada, CFRX Toronto | 6070do | | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 | Canada, CFVP Calgary | 6030do | | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 | Canada, CHNX Halifax | 6130do | | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 | Canada, CKZU Vancouver | 6160do | | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0530 mtwhf | Canada, R Canada Intl | 6050eu | 7295af | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 | Costa Rica, Adv World R | 5030ca | 6150ca | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 as | Costa Rica, Adv World R | 7375am | | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 | Costa Rica, RF Peace Intl | 7385am | 7585am | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 | Cuba, Radio Havana | 9820na | 9830na | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 | Ecuador, HCJB | 9745am | 21455am | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0550 | Germany, Deutsche Welle | 5960na | 6045na | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| | | 6185na | 9615na | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |
| 0500-0600 | Guyana, GBC/Voice of | 3290do | | 0600-0700 vl | Canada, CBC N Quebec Svc | 9625do | | | |

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| GE1-6 | Clark Belt 103 deg W | 5.8 MHz Wide Audio |
| WWCR | Nashville, TN | 5070 kHz Live |
| | rebroadcast 0805 Mon | 7435 kHz |
| WCNJ | Hazlet, NJ | 89.3 FM |
| W220AA | Sayreville, NJ | 91.9 FM |
| WNJC | Deptford, NJ | 1360 AM |
| WODI | Brookneal, VA | 1230 AM |

0600 UTC

2:00 AM EDT/11:00 PM PDT

SHORTWAVE GUIDE

0700 UTC

3:00 AM EDT/12:00 PM PDT

M

FREQUENCIES

| | | | | | | |
|------------------|----------------------------|---------|---------|-------------------|----------------------------|---------|
| 0600-0700 | Canada, CFRX Toronto | 6070do | | 0700-0800 | Canada, CHNX Halifax | 6130do |
| 0600-0700 | Canada, CFVP Calgary | 6030do | | 0700-0800 | Canada, CKZU Vancouver | 6160do |
| 0600-0700 | Canada, CHNX Halifax | 6130do | | 0700-0800 | Costa Rica, RF Peace Intl | 7385am |
| 0600-0700 | Canada, CKZU Vancouver | 6160do | | 0700-0708 s | Croatia, Croatian Radio | 5920eu |
| 0600-0700 | Costa Rica, RF Peace Intl | 7385am | 7585am | 0700-0727 | Czech Rep, Radio Prague | 7345eu |
| 0600-0608 mtwhf | Croatia, Croatian Radio | 5920eu | 7165va | 0700-0730 | Ecuador, HCJB | 9645pa |
| 0600-0700 | Cuba, Radio Havana | 9820na | 9830eu | 0700-0800 as | Eqt Guinea, R East Africa | 15186af |
| 0600-0700 | Ecuador, HCJB | 9745am | 21455am | 0700-0800 mtwhf | Eqt Guinea, Radio Africa | 15186af |
| 0600-0650 | Germany, Deutsche Welle | 11915af | 13790af | 0700-0715 | Ghana, Ghana Broadc Corp | 3366do |
| | | 17860af | 21680af | 0700-0800 | Guyana, GBC/Voice of | 3290do |
| 0600-0615 | Ghana, Ghana Broadc Corp | 3366do | 4915do | 0700-0730 vl | Italy, IRRS | 3985va |
| 0600-0700 | Guyana, GBC/Voice of | 3290do | | 0700-0800 | Japan, R Japan/NHK World | 7230eu |
| 0600-0700 vl | Italy, IRRS | 3985va | | | | 11740as |
| 0600-0700 | Japan, R Japan/NHK World | 5975eu | 7230eu | 11740as | | 11840as |
| | | 11840as | 11910am | 11920na | | 11920as |
| | | 15230na | 15550va | 12030as | | 15230na |
| 0600-0700 vl | Kenya, Kenya Broadc Corp | 4885do | 4935do | 0700-0800 vl | Kenya, Kenya Broadc Corp | 4885do |
| 0600-0700 vl | Kiribati, Radio | 9810do | | 0700-0800 vl | Kiribati, Radio | 9810do |
| 0600-0700 | Lebanon, Voice of Hope | 9960va | | 0700-0800 | Lebanon, Voice of Hope | 9960va |
| 0600-0700 | Liberia, LCN/R Liberia Int | 5100do | | 0700-0715 | Liberia, LCN/R Liberia Int | 5100do |
| 0600-0700 | Malaysia, Voice of | 6175as | 9750as | 0700-0800 asmtwhf | Malaysia, Radio | 7295do |
| 0600-0700 | New Zealand, R NZ Intl | 9795pa | | 0700-0800 | Malaysia, Voice of | 6175as |
| 0600-0630 | Nigeria, FRCN/Radio | 3326do | 4770do | 0700-0800 | Monaco, Trans World Radio | 9755eu |
| 0600-0700 | Nigeria, Voice of | 7255af | | 0700-0758 as | New Zealand, R NZ Intl | 9795pa |
| 0600-0657 | North Korea, R Pyongyang | 15180as | 15230as | 0700-0800 mtwhf | New Zealand, R NZ Intl | 9795pa |
| 0600-0630 s | Norway, Radio Norway Intl | 7180eu | 7295pa | 0700-0757 | North Korea, R Pyongyang | 15340af |
| 0600-0700 vl | Papua New Guinea, NBC | 9675do | | 0700-0730 s | Norway, Radio Norway Intl | 15245me |
| 0600-0700 | Russia, Voice of Russia WS | 12000au | 12010as | 0700-0800 vl | Papua New Guinea, NBC | 9675do |
| | | 12070as | 13645pa | 0700-0745 | Romania, R Romania Intl | 15370pa |
| | | 15490pa | 15560au | 0700-0715 s | Romania, R Romania Intl | 15370pa |
| | | 17570au | 17580as | 0700-0800 | Russia, Voice of Russia WS | 15560au |
| 0600-0630 | S Africa, Channel Africa | 11900af | | 0700-0715 s | Russia, Voice of Russia WS | 15580as |
| 0600-0630 | S Africa, Trans World R | 11730af | | 0700-0745 | Romania, R Romania Intl | 17570au |
| 0600-0610 | Sierra Leone, SLBS | 3316do | | 0700-0758 as | Sierra Leone, SLBS | 3316do |
| 0600-0630 | Slovakia, AWR Europe | 11640af | | 0700-0800 vl | Slovakia, AWR Europe | 9440eu |
| 0600-0630 vl | Solomon Islands, SIBC | 5020do | | 0700-0800 | Solomon Islands, SIBC | 5020do |
| 0600-0700 | Swaziland, Trans World R | 4775af | 6100af | 0700-0800 | Swaziland, Trans World R | 9650af |
| 0600-0630 | Swaziland, Trans World R | 11730af | | 0700-0800 | Taiwan, VO Free China | 5950na |
| 0600-0630 | Switzerland, Swiss R Intl | 9885af | 11860af | 0700-0800 | United Kingdom, BBC WS | 5975na |
| 0600-0700 | United Kingdom, BBC WS | 5975am | 6005af | 0700-0710 | Sierra Leone, SLBS | 6190af |
| | | 6190af | 6195eu | 0700-0730 | Slovakia, AWR Europe | 7145as |
| | | 7325va | 9410va | 0700-0800 | Solomon Islands, SIBC | 7325eu |
| | | 11760as | 11780eu | 0700-0715 | Swaziland, Trans World R | 9810do |
| | | 15310as | 15360as | 0700-0730 | Taiwan, VO Free China | 9810do |
| | | 15575va | 17640af | 0700-0800 as | United Kingdom, BBC WS | 9410eu |
| | | 21660as | | 0700-0800 | United Kingdom, BBC WS | 17885af |
| 0600-0700 | USA, KAIJ Dallas TX | 5810am | | 0700-0800 | United Kingdom, BBC WS | 17885af |
| 0600-0700 | USA, KTBN Salt Lk City UT | 7510am | | 0700-0800 | United Kingdom, BBC WS | 6005af |
| 0600-0700 | USA, KVOH Los Angeles CA | 9975am | | 0700-0800 | United Kingdom, BBC WS | 6180eu |
| 0600-0700 | USA, KWHR Naalehu HI | 17780as | | 0700-0800 | United Kingdom, BBC WS | 6195eu |
| 0600-0630 | USA, Voice of America | 5970af | 5995af | 0700-0800 | United Kingdom, BBC WS | 11780eu |
| | | 7170va | 7195af | 0700-0800 | USA, KAIJ Dallas TX | 5810am |
| | | 11805af | 11950af | 0700-0800 | USA, KTBN Salt Lk City UT | 7510am |
| | | 15205va | | 0700-0800 | USA, KWHR Naalehu HI | 17780as |
| 0600-0700 | USA, WEWN Birmingham AL | 5825eu | | 0700-0800 | USA, WEWN Birmingham AL | 5825eu |
| 0600-0700 | USA, WHRI Noblesville IN | 5745am | 7315am | 0700-0800 | USA, WHRI Noblesville IN | 5745am |
| 0600-0700 | USA, WJCR Upton KY | 7490na | | 0700-0800 | USA, WJCR Upton KY | 7490na |
| 0600-0700 mtwhf | USA, WMLK Bethel PA | 9465eu | | 0700-0800 | USA, WMLK Bethel PA | 9465eu |
| 0600-0700 | USA, WRMI/R Miami Intl | 9955am | | 0700-0800 | USA, WRMI/R Miami Intl | 9955am |
| 0600-0700 | USA, WRNO New Orleans LA | 7355am | | 0700-0800 | USA, WRNO New Orleans LA | 7355am |
| 0600-0700 | USA, WWCR Nashville TN | 2390am | 3210am | 0700-0800 | USA, WWCR Nashville TN | 2390am |
| 0600-0700 | USA, WYFR Okeechobee FL | 5985am | 7355eu | 0700-0800 | USA, WYFR Okeechobee FL | 7355eu |
| 0600-0700 vl | Vanuatu, Radio | 3945do | 4960do | 0700-0800 | Vanuatu, Radio | 3945do |
| 0600-0645 vl/m-f | Vatican State, Vatican R | 5882va | 7250va | 0700-0745 s | Zambia, Christian Voice | 6065af |
| | | 15595va | 9645va | 0700-0800 | Zambia, R Zambia/ZNBC 1 | 7220do |
| | | 10060as | | 0700-0800 | Zimbabwe, Zimbabwe BC | 5975do |
| 0600-0630 | Vietnam, Voice of | 5925as | | 0700-0800 | Austria, R Austria Intl | 6155eu |
| 0600-0700 | Yemen, Radio Aden | 9780do | | 0700-0800 | Ecuador, HCJB | 9645pa |
| 0600-0700 | Zambia, Christian Voice | 3330af | 6065af | 0700-0800 | Zambia, Christian Voice | 9645pa |
| 0600-0700 vl | Zambia, R Zambia/ZNBC 1 | 7220do | | 0700-0800 | Guam, TWR/KTWR | 9645pa |
| 0600-0700 vl | Zimbabwe, Zimbabwe BC | 5975do | | 0700-0800 | Guam, TWR/KTWR | 9645pa |
| 0615-0630 | Switzerland, Swiss R Intl | 6165eu | 9535eu | 0745-0800 s | Greece, Voice of | 7430eu |
| 0630-0700 | Belgium, R Vlaanderen Int | 6035eu | 9925eu | 0745-0800 s | Greece, Voice of | 7450eu |
| 0630-0700 | Georgia, Radio | 11805eu | | 0745-0800 s | India, All India Radio | 11645eu |
| 0630-0645 s | Swaziland, Trans World R | 11730af | | 0745-0800 s | Italy, IRRS | 15185do |
| 0630-0658 | Vatican State, Vatican R | 11625af | 13765af | 0745-0800 s | Netherlands, Radio | 7125va |
| 0631-0640 | Romania, R Romania Intl | 9550eu | 9665eu | 0745-0800 s | Palau, KHN/VO of Hope | 9730as |
| 0645-0700 as | Monaco, Trans World Radio | 9755eu | 11810eu | 0745-0800 s | United Kingdom, BBC WS | 15400va |
| 0645-0700 | Romania, R Romania Intl | 11740pa | 11840pa | 0745-0800 s | Swaziland, Trans World R | 4775af |
| | | 17720pa | | 0745-0800 s | Guam, TWR/KTWR | 9500af |
| 0655-0700 mtwhf | Monaco, Trans World Radio | 9755eu | | 0745-0800 s | Ghana, Ghana Broadc Corp | 3366do |
| 0700-0800 | Anguilla, Caribbean Beacon | 6090am | | 0745-0800 s | Ghana, Ghana Broadc Corp | 4915do |
| 0700-0800 | Australia, Radio | 9660pa | 11830as | 0745-0800 s | Greece, Voice of | 7430eu |
| 0700-0800 vl | Australia, VL8K Katherine | 5025do | 12080pa | 0745-0800 s | India, All India Radio | 15260do |
| 0700-0800 vl | Australia, VL8T Tent Crk | 4910do | 15510as | 0745-0800 s | Italy, IRRS | 7125va |
| 0700-0800 | Canada, CFRX Toronto | 6070do | | 0745-0800 s | Netherlands, Radio | 9820pa |
| 0700-0800 | Canada, CFVP Calgary | 6030do | | 0745-0800 s | Palau, KHN/VO of Hope | 9730as |
| | | | | 0745-0800 s | United Kingdom, BBC WS | 15565va |
| | | | | 0745-0800 s | Swaziland, Trans World R | 9500af |
| | | | | 0745-0800 s | Guam, TWR/KTWR | 9650af |
| | | | | 0745-0800 s | Ghana, Ghana Broadc Corp | 3366do |
| | | | | 0745-0800 s | Greece, Voice of | 7430eu |
| | | | | 0745-0800 s | India, All India Radio | 15260do |
| | | | | 0745-0800 s | Italy, IRRS | 7125va |
| | | | | 0745-0800 s | Netherlands, Radio | 9820pa |
| | | | | 0745-0800 s | Palau, KHN/VO of Hope | 9730as |
| | | | | 0745-0800 s | United Kingdom, BBC WS | 15565va |
| | | | | 0745-0800 s | Swaziland, Trans World R | 9500af |
| | | | | 0745-0800 s | Guam, TWR/KTWR | 9650af |
| | | | | 0745-0800 s | Ghana, Ghana Broadc Corp | 3366do |
| | | | | 0745-0800 s | Greece, Voice of | 7430eu |
| | | | | 0745-0800 s | India, All India Radio | 15260do |
| | | | | 0745-0800 s | Italy, IRRS | 7125va |
| | | | | 0745-0800 s | Netherlands, Radio | 9820pa |
| | | | | 0745-0800 s | Palau, KHN/VO of Hope | 9730as |
| | | | | 0745-0800 s | United Kingdom, BBC WS | 15565va |
| | | | | 0745-0800 s | Swaziland, Trans World R | 9500af |
| | | | | 0745-0800 s | Guam, TWR/KTWR | 9650af |
| | | | | 0745-0800 s | Ghana, Ghana Broadc Corp | 3366do |
| | | | | 0745-0800 s | Greece, Voice of | 7430eu |
| | | | | 0745-0800 s | India, All India Radio | 15260do |
| | | | | 0745-0800 s | Italy, IRRS | 7125va |
| | | | | 0745-0800 s | Netherlands, Radio | 9820pa |
| | | | | 0745-0800 s | Palau, KHN/VO of Hope | 9730as |
| | | | | 0745-0800 s | United Kingdom, BBC WS | 15565va |
| | | | | 0745-0800 s | Swaziland, Trans World R | 9500af |
| | | | | 0745-0800 s | Guam, TWR/KTWR | 9650af |
| | | | | 0745-0800 s | Ghana, Ghana Broadc Corp | 3366do |
| | | | | 0745-0800 s | Greece, Voice of | 7430eu |
| | | | | 0745-0800 s | India, All India Radio | 15260do |
| | | | | 0745-0800 s | Italy, IRRS | 7125va |
| | | | | 0745-0800 s | Netherlands, Radio | 9820pa |
| | | | | 0745-0800 s | Palau, KHN/VO of Hope | 9730as |
| | | | | 0745-0800 s | United Kingdom, BBC WS | 15565va |
| | | | | 0745-0800 s | Swaziland, Trans World R | 9500af |
| | | | | 0745-0800 s | Guam, TWR/KTWR | 9650af |
| | | | | 0745-0800 s | Ghana, Ghana Broadc Corp | 3366do |
| | | | | 0745-0800 s | Greece, Voice of | 7430eu |
| | | | | 0745-0800 s | India, All India Radio | 15260do |
| | | | | 0745-0800 s | Italy, IRRS | 7125va |
| | | | | 0745-0800 s | Netherlands, Radio | 9820pa |
| | | | | 0745-0800 s | Palau, KHN/VO of Hope | 9730as |
| | | | | 0745-0800 s | United Kingdom, BBC WS | 15565va |
| | | | | 0745-0800 s | Swaziland, Trans World R | 9500af |
| | | | | 0745-0800 s | Guam, TWR/KTWR | 9650af |
| | | | | 0745-0800 s | Ghana, Ghana Broadc Corp | 3366do |
| | | | | 0745-0800 s | Greece, Voice of | 7430eu |
| | | | | 0745-0800 s | India, All India Radio | 15260do |
| | | | | 0745-0800 s | Italy, IRRS | 7125va |
| | | | | 0745-0800 s | Netherlands, Radio | 9820pa |
| | | | | 0745-0800 s | Palau, KHN/VO of Hope | 9730as |
| | | | | 0745-0800 s | United Kingdom, BBC WS | 15565va |
| | | | | 0745-0800 s | Swaziland, Trans World R | 9500af |
| | | | | 0745-0800 s | Guam, TWR/KTWR | 9650af |
| | | | | 0745-0800 s | Ghana, Ghana Broadc Corp | 3366do |
| | | | | 0745-0800 s | Greece, Voice of | 7430eu |
| | | | | 0745-0800 s | India, All India Radio | 15260do |
| | | | | 0745-0800 s | Italy, IRRS | 7125va |
| | | | | 0745-0800 s | Netherlands, Radio | 9820pa |
| | | | | 0745-0800 s | Palau, KHN/VO of Hope | 9730as |
| | | | | 0745-0800 s | United Kingdom, BBC WS | 15565va |
| | | | | 0745-0800 s | Swaziland, Trans World R | 9500af |
| | | | | 0745-0800 s | Guam, TWR/KTWR | 9650af |
| | | | | 0745-0800 s | Ghana, Ghana Broadc Corp | 3366do |
| | | | | 0745-0800 s | Greece, Voice of | 7430eu |
| | | | | 0745-0800 s | India, All India Radio | 15260do |
| | | | | 0745-0800 s | Italy, IRRS | 7125va |
| | | | | 0745-0800 s | Netherlands, Radio | 9820pa |
| | | | | 0745-0800 s | Palau, KHN/VO of Hope | 9730as |
| | | | | 0745-0800 s | United Kingdom, BBC WS | 15565va |
| | | | | 0745-0800 s | Swaziland, Trans World R | 9500af |
| | | | | 0745-0800 | | |

FREQUENCIES

| | | | | | | | | | | | | |
|------------------|----------------------------|---------|---------|---------|---------|------------------|----------------------------|---------|---------|---------|---------|---------|
| 0800-0808 mtwhfa | Croatia, Croatian Radio | 5920eu | 7165eu | 9830eu | 13830au | | | | 15410af | 17715au | 17800af | 21600af |
| 0800-0900 | Ecuador, HCJB | 9645pa | 9765eu | 21455au | | 0900-0915 mtwtff | Ghana, Ghana Broadc Corp | 3366do | 4915do | | | |
| 0800-0900 as | Eqt Guinea, R East Africa | 15186af | | | | 0900-0955 | Guam, TWR/KTWR | 11835as | | | | |
| 0800-0900 mtwhf | Eqt Guinea, Radio Africa | 15186af | | | | 0900-1000 | Guyana, GBC/Voice of | 3290do | | | | |
| 0800-0830 | Finland, YLE/R Finland | 13645as | 15235au | | | 0900-0930 vl | Italy, IRRS | 7125va | | | | |
| 0800-0805 s | Ghana, Ghana Broadc Corp | 3366do | | | | 0900-0920 tfa | Kazakhstan, Radio Almaty | 9620eu | 11720eu | | | |
| 0800-0900 | Guam, TWR/KTWR | 15200as | | | | 0900-0930 vl | Kiribati, Radio | 9810do | | | | |
| 0800-0900 | Guyana, GBC/Voice of | 3290do | | | | 0900-1000 | Lebanon, Voice of Hope | 9960va | | | | |
| 0800-0900 | Indonesia, Voice of | 9525as | | | | 0900-0915 | Liberia,LCN/R Liberia Int | 5100do | | | | |
| 0800-0900 vl | Italy, IRRS | 7125va | | | | 0900-1000 | Malaysia, Radio | 7295do | | | | |
| 0800-0900 vl | Kiribati, Radio | 9810do | | | | 0900-1000 | Mongolia, Voice of | 15170as | | | | |
| 0800-0900 | Lebanon, Voice of Hope | 9960va | | | | 0900-0930 | Netherlands, Radio | 9720pa | 9820au | 13700pa | | |
| 0800-0900 | Liberia,LCN/R Liberia Int | 5100do | | | | 0900-0925 | New Zealand, R NZ Intl | 6100pa | | | | |
| 0800-0900 | Malaysia, Radio | 7295do | | | | 0900-1000 | Norway, Radio Norway Intl | 13800as | 15625au | | | |
| 0800-0825 | Malaysia, Voice of | 6175as | 9750as | 15295au | | 0900-0930 s | Palau, KHN/Voice of Hope | 9730as | | | | |
| 0800-0835 a | Monaco, Trans World Radio | 9755eu | | | | 0900-1000 as | Papua New Guinea, NBC | 4890do | | | | |
| 0800-0850 s | Monaco, Trans World Radio | 9755eu | | | | 0900-1000 vl | Russia, Voice of Russia WS | 7390as | 9810as | 11800as | 11880as | |
| 0800-0820 mtwhf | Monaco, Trans World Radio | 9755eu | | | | 0900-1000 | | 17610as | 17795as | | | |
| 0800-0900 | Netherlands, Radio | 9720pa | 9820pa | | | 0900-1000 s | Slovakia, AWR Europe | 9450eu | | | | |
| 0800-0816 mtwhf | New Zealand, R NZ Intl | 9795pa | | | | 0900-0930 | Switzerland, Swiss R Intl | 9885au | 13685au | 17515au | | |
| 0800-0857 | North Korea, R Pyongyang | 15180as | 15230as | | | 0900-1000 | United Kingdom, BBC WS | 5965as | 6190af | 6195as | 9410eu | |
| 0800-0830 s | Norway, Radio Norway Intl | 15625as | | | | 0900-1000 | | 9740as | 11750as | 11765va | 11940af | |
| 0800-0804 | Pakistan, Radio | 7110as | 15465eu | 17865eu | | 0900-1000 | | 11945as | 12095eu | 15190sa | 15360as | |
| 0800-0900 as | Palau, KHN/Voice of Hope | 9730as | | | | 0900-1000 | | 15400af | 15485va | 15565as | 15575va | |
| 0800-0900 vl | Papua New Guinea, NBC | 9675do | | | | 0900-1000 | | 17640va | 17705eu | 17830af | 21660as | |
| 0800-0900 | Russia, Voice of Russia WS | 9810au | 11800au | 15470as | 15490as | 0900-0915 | United Kingdom, BBC WS | 7325eu | 15310as | 15360pa | 17785as | |
| 0800-0900 f | Seychelles, FEBA Radio | 15540as | | | | 0900-0945 | United Kingdom, BBC WS | 9580as | 11760as | 11955as | 15280as | |
| 0800-0810 | Sierra Leone, SLBS | 3316do | | | | 0900-1000 | USA, KAIJ Dallas TX | 5810am | | | | |
| 0800-0900 vl | Solomon Islands, SIBC | 5020do | | | | 0900-1000 | USA, KTBN Salt Lk City UT | 7510am | | | | |
| 0800-0900 | South Korea, R Korea Intl | 9570au | 13670eu | | | 0900-1000 | USA, KWHR Naalehu HI | 9930as | | | | |
| 0800-0805 as | Swaziland, Trans World R | 4775af | 9500af | 9650af | | 0900-1000 | USA, Monitor Radio Intl | 7395sa | 7535eu | 9385au | 15665as | |
| 0800-0900 | United Kingdom, BBC WS | 6190af | 7325eu | 9410eu | 9740as | 0900-1000 | USA, WEWN Birmingham AL | 5825eu | 7425na | | | |
| 0800-0900 as | United Kingdom, BBC WS | 11750as | 11760as | 11940af | 11955as | 0900-1000 | USA, WGTC McCaysville GA | 9400am | | | | |
| 0800-0900 | | 12095eu | 15310as | 15360va | 15400af | 0900-1000 | USA, WHRI Noblesville IN | 5745am | 7315am | | | |
| 0800-0900 | | 15485va | 15575va | 17640va | 17760as | 0900-1000 | USA, WJCR Upton KY | 7490na | | | | |
| 0800-0900 | | 17785as | 17830af | 21660as | | 0900-1000 as | USA, WRMI/R Miami Intl | 9955am | | | | |
| 0800-0900 as | United Kingdom, BBC WS | 15565va | 17885af | | | 0900-1000 | USA, WRNO New Orleans LA | 7355am | | | | |
| 0800-0815 | United Kingdom, BBC WS | 7145pa | 11835af | | | 0900-1000 | USA, WWCR Nashville TN | 2390am | 3210am | 5070am | 5935am | |
| 0800-0900 | USA, KAIJ Dallas TX | 5810am | | | | 0900-1000 | Zambia, Christian Voice | 6065af | | | | |
| 0800-0900 | USA, KNLS Anchor Point AK | 9615as | | | | 0900-1000 vl | Zambia, R Zambia/ZNBC 1 | 7220do | | | | |
| 0800-0900 | USA, KTBN Salt Lk City UT | 7510am | | | | 0900-1000 vl | Zimbabwe, Zimbabwe BC | 5975do | | | | |
| 0800-0900 | USA, KWHR Naalehu HI | 9930as | | | | 0915-1000 | Ghana, Ghana Broadc Corp | 6130do | 7295do | | | |
| 0800-0900 | USA, Monitor Radio Intl | 7535eu | 9845au | 15665eu | | 0920-0940 w | Kazakhstan, Radio Almaty | 9620eu | 11720eu | | | |
| 0800-0900 | USA, WEWN Birmingham AL | 5825eu | 7425na | | | 0930-0955 mtwhf | Austria, R Austria Intl | 15455au | 17870au | | | |
| 0800-0900 | USA, WHRI Noblesville IN | 5745am | 7315am | | | 0930-1000 | Canada, CKZN St John's | 6160do | | | | |
| 0800-0900 | USA, WJCR Upton KY | 7490na | | | | 0930-1000 | Georgia, Radio | 11910me | | | | |
| 0800-0900 | USA, WRMI/R Miami Intl | 9955am | | | | 0930-1000 | Netherlands, Radio | 12065au | 13710pa | | | |
| 0800-0900 | USA, WRNO New Orleans LA | 7355am | | | | 0930-1000 | Philippines, FEBC/R Intl | 11635as | | | | |
| 0800-0900 | USA, WWCR Nashville TN | 2390am | 3210am | 5070am | 5935am | 1000-1100 | Anguilla, Caribbean Beacon | 6090am | | | | |
| 0800-0900 | Zambia, Christian Voice | 6065af | | | | 1000-1100 | Australia, Radio | 9580pa | | | | |
| 0800-0900 vl | Zambia, R Zambia/ZNBC 1 | 7220do | | | | 1000-1100 vl | Australia, VL8A Alice Spg | 2310do | | | | |
| 0800-0900 vl | Zimbabwe, Zimbabwe BC | 5975do | | | | 1000-1100 vl | Australia, VL8K Katherine | 2485do | | | | |
| 0804-0850 | Pakistan, Radio | 15465eu | 17865eu | | | 1000-1100 vl | Australia, VL8T Tent Crk | 2325do | | | | |
| 0815-0900 mtwhf | Nigeria, FRCN/Radio | 3326do | 4770do | 4990do | | 1000-1100 vl | Canada, CBC N Quebec Svc | 9625do | | | | |
| 0817-0900 | New Zealand, R NZ Intl | 6100pa | | | | 1000-1100 | Canada, CFRX Toronto | 6070do | | | | |
| 0820-0900 vl | Chile, R Esperanza | 6089am | | | | 1000-1100 | Canada, CFVP Calgary | 6030do | | | | |
| 0830-0900 s | Armenia, Voice of | 15270eu | | | | 1000-1100 | Canada, CHNX Halifax | 6130do | | | | |
| 0830-0900 vl | Australia, VL8A Alice Spg | 2310do | | | | 1000-1100 | Canada, CKZN St John's | 6160do | | | | |
| 0830-0900 vl | Australia, VL8K Katherine | 2485do | | | | 1000-1100 | Canada, CKZU Vancouver | 6160do | | | | |
| 0830-0900 vl | Australia, VL8T Tent Crk | 2325do | | | | 1000-1100 | China, China Radio Intl | 9785pa | 11755pa | | | |
| 0830-0900 | Georgia, Radio | 11910eu | | | | 1000-1100 | Costa Rica, RF Peace Intl | 7385am | 7585am | | | |
| 0830-0840 | India, All India Radio | 7250do | 15185do | 15260do | | 1000-1100 | Ecuador, HCJB | 9645pa | 21455au | | | |
| 0830-0900 | Lithuania, Radio Vilnius | 9710eu | | | | 1000-1100 as | Eqt Guinea, R East Africa | 15186af | | | | |
| 0830-0900 | Slovakia, R Slovakia Intl | 11990au | 15460au | 17570au | | 1000-1100 mtwhf | Eqt Guinea, Radio Africa | 15186af | | | | |
| 0830-0900 | United Kingdom, BBC WS | 15280as | | | | 1000-1100 | Guam, AWER/KSDA | 11790as | | | | |
| 0855-0900 | Guam, TWR/KTWR | 11830au | | | | 1000-1100 | Guam, TWR/KTWR | 9865as | | | | |
| 0900-1000 | Anguilla, Caribbean Beacon | 6090am | | | | 1000-1100 | India, All India Radio | 11585as | 13700as | 15050as | 17387au | |
| 0900-1000 | Australia, Radio | 9580pa | 11640pa | | | 1000-1025 | Israel, Kol Israel | 15640eu | | | | |
| 0900-1000 vl | Australia, VL8A Alice Spg | 2310do | | | | 1000-1100 vl | Italy, IRRS | 7125va | | | | |
| 0900-1000 vl | Australia, VL8K Katherine | 2485do | | | | 1000-1100 | Jordan, Radio | 11690eu | | | | |
| 0900-1000 vl | Australia, VL8T Tent Crk | 2325do | | | | 1000-1100 | Lebanon, Voice of Hope | 9960va | | | | |
| 0900-0925 | Belgium, R Vlaanderen Int | 6035eu | 7190eu | | | 1000-1100 | Malaysia, Radio | 7295do | | | | |
| 0900-1000 | Canada, CFRX Toronto | 6070do | | | | 1000-1100 | Malaysia, RTM Kuching | 7160do | | | | |
| 0900-1000 | Canada, CFVP Calgary | 6030do | | | | 1000-1100 | Malaysia, RTM KotaKinabalu | 5980do | | | | |
| 0900-1000 | Canada, CHNX Halifax | 6130do | | | | 1000-1025 | Netherlands, Radio | 12065au | 13710pa | | | |
| 0900-1000 | Canada, CKZU Vancouver | 6160do | | | | 1000-1100 | New Zealand, R NZ Intl | 6100pa | | | | |
| 0900-0935 vl | Chile, R Esperanza | 6089am | | | | 1000-1100 | New Zealand, R NZ Intl | 9835am | | | | |
| 0900-1000 | China, China Radio Intl | 9785pa | 11755pa | | | 1000-1100 | Italy, IRRS | 7125va | | | | |
| 0900-1000 | Costa Rica, RF Peace Intl | 7385am | 7585am | | | 1000-1100 | Jordan, Radio | 11690eu | | | | |
| 0900-1000 | Croatia, Croatian Radio | 5920eu | 7165va | 9830eu | 13830au | 1000-1100 as | Lebanon, Voice of Hope | 9960va | | | | |
| 0900-0927 | Czech Rep, Radio Prague | 15640me | 17485af | | | 1000-1100 | Malaysia, Radio | 7295do | | | | |
| 0900-1000 | Ecuador, HCJB | 9645pa | 21455au | | | 1000-1100 | Malaysia, RTM Kuching | 7160do | | | | |
| 0900-0930 | Ecuador, HCJB | 9645pa | 9765eu | | | 1000-1100 | Malaysia, RTM KotaKinabalu | 5980do | | | | |
| 0900-1000 as | Eqt Guinea, R East Africa | 15186af | | | | 1000-1100 | Philippines, FEBC/R Intl | 11635as | | | | |
| 0900-1000 mtwhf | Eqt Guinea, Radio Africa | 15186af | | | | 1000-1100 | Philippines, FEBC/R Intl | 11635as | | | | |
| 0900-0950 | Germany, Deutsche Welle | 6160au | 9565af | 12025af | 12055as | 1000-1100 | Russia, Voice of Russia WS | 7390as | 7390as | 9810au | 9835au | |
| | | | | | | 1000-1100 | Russia, Voice of Russia WS | 11655as | 11655as | 11800as | 15170as | |
| | | | | | | 1000-1100 | Nigeria, Voice of | 15435as | 15435as | 15510as | 17560as | |
| | | | | | | 1000-1100 | Palau, KHN/Voice of Hope | 9730as | 9730as | 17775as | 17795as | |
| | | | | | | 1000-1100 | Papua New Guinea, NBC | 4890do | 4890do | | | |
| | | | | | | 1000-1100 | Philippines, FEBC/R Intl | 11635as | 11635as | | | |
| | | | | | | 1000-1100 | Russia, Voice of Russia WS | 7390as | 7390as | 9810au | 9835au | |
| | | | | | | 1000-1100 | Solomon Islands, SIBC | 5020do | | | | |

1000 UTC

6:00 AM EDT/3:00 AM PDT

SHORTWAVE GUIDE

1100 UTC

7:00 AM EDT/4:00 AM PDT

FREQUENCIES

| | | | | | | | |
|------------------|----------------------------|---------|---------|---------|--------------|--|---------|
| 1000-1030 | Switzerland, Swiss R Intl | 6165eu | 9535eu | | 1100-1200 | USA, KAIJ Dallas TX | 5810am |
| 1000-1100 | United Kingdom, BBC WS | 5965va | 6190af | 6195am | 1100-1200 | USA, KTBN Salt Lk City UT | 7510am |
| | | 9740as | 11750as | 11760as | 1100-1200 | USA, KWHR Naalehu HI | 9930as |
| | | 11940af | 12095eu | 15310as | 1100-1200 | USA, Monitor Radio Intl | 6095na |
| | | 15565as | 15575me | 17640af | | | 9430au |
| | | 17885va | 21660as | 17705af | 1100-1200 | USA, Voice of America | 5985pa |
| 1000-1100 as | United Kingdom, BBC WS | 15190am | 15400am | 17830af | | | 6160as |
| 1000-1030 | United Kingdom, BBC WS | 15360as | | | 1100-1200 | USA, WEWN Birmingham AL | 7425eu |
| 1000-1100 | USA, KAIJ Dallas TX | 5810am | | | 1100-1200 | USA, WHRI Noblesville IN | 6040am |
| 1000-1100 | USA, KTBN Salt Lk City UT | 7510am | | | 1100-1200 | USA, WJCR Upton KY | 7490na |
| 1000-1100 | USA, KWHR Naalehu HI | 9930as | | | 1100-1200 | USA, WRM/R Miami Intl | 9955am |
| 1000-1100 | USA, Monitor Radio Intl | 6095na | 7395sa | 15665as | 1100-1200 | USA, WRNO New Orleans LA | 7355am |
| 1000-1100 | USA, Voice of America | 5985pa | 6165am | 7405am | 1100-1200 | USA, WYCR Nashville TN | 2390am |
| | | 11720as | 15425as | 9590am | 1100-1200 | USA, WYFR Okeechobee FL | 5950na |
| 1000-1100 | USA, WEWN Birmingham AL | 7425na | | | 1100-1130 | Vietnam, Voice of Zambia, Christian Voice | 7285as |
| 1000-1100 | USA, WGTG McCaysville GA | 9400am | | | 1100-1200 | Zambia, R Zambia/ZNBC 1 | 6065af |
| 1000-1100 | USA, WHRI Noblesville IN | 6040am | 9495am | | 1100-1200 | Australia, DefenseForces R | 7220do |
| 1000-1100 | USA, WJCR Upton KY | 7490na | | | 1120-1140 | China, China Radio Intl | 4763as |
| 1000-1100 | USA, WRM/R Miami Intl | 9955am | | | 1130-1200 | Iran, VOIRI | 6995as |
| 1000-1100 | USA, WRNO New Orleans LA | 7355am | | | 1130-1200 | Lesotho, Radio Lesotho | 8660as |
| 1000-1100 | USA, WWCR Nashville TN | 2390am | 5070am | 5935am | 1130-1140 | Myanmar, Voice of Netherlands, Radio | 11445as |
| 1000-1100 | USA, WYFR Okeechobee FL | 5950na | | | 1130-1200 | Sweden, Radio | 11700as |
| 1000-1030 vt/m-f | Vatican State, Vatican R | 5882eu | 9645eu | 11740eu | 1130-1200 | United Kingdom, BBC WS | 5990da |
| | | 17550eu | | | 1130-1200 | Vatican State, Vatican R | 11875as |
| 1000-1030 | Vietnam, Voice of | 5940as | 7270as | 7400as | 1130-1200 | India, All India Radio | 4800do |
| | | 12020as | 15010as | 9840as | 1130-1200 | Anguilla, Caribbean Beacon | 11710do |
| 1000-1100 | Zambia, Christian Voice | 6065af | | | 1135-1140 | Australia, Radio | 5995as |
| 1000-1100 vt | Zambia, R Zambia/ZNBC 1 | 7220do | | | 1200-1300 | Australia, VL8A Alice Spg | 6080as |
| 1030-1055 s | Austria, R Austria Intl | 15455au | 17870au | | 1200-1300 | Australia, VL8K Katherine | 9580pa |
| 1030-1057 | Czech Rep, Radio Prague | 7345eu | 9505eu | | 1200-1300 | Australia, VL8T Tent Crk | 11800pa |
| 1030-1100 mtwhf | Ethiopia, Radio | 5990do | 7110do | 9705do | 1200-1300 | Brazil, Radio Bras | 11705va |
| 1030-1100 | Guam, AWR/KSDA | 15170as | | | 1200-1300 | Bulgaria, Radio | 15240na |
| 1030-1100 | Netherlands, Radio | 6045eu | 9860eu | 12065as | 1200-1300 | Cambodia, Natl Voice of Canada, CBC N Quebec Svc | 11940as |
| 1030-1100 | South Korea, R Korea Intl | 11715am | | | 1200-1300 | Canada, CFRX Toronto | 9625do |
| 1030-1100 | Sri Lanka, Sri Lanka BC | 11835as | 17850as | | 1200-1300 | Canada, CFVP Calgary | 6070do |
| 1030-1055 | UAE, Radio Dubai | 13675eu | 15395eu | 17630eu | 1200-1215 | Canada, CHNX Halifax | 6030do |
| 1100-1200 | Anguilla, Caribbean Beacon | 11775am | | | 1200-1300 | Canada, CKZN St John's | 6130do |
| 1100-1200 | Australia, Radio | 6080as | 9580pa | | 1200-1300 | Canada, CKZU Vancouver | 6160do |
| 1100-1200 s | Australia, Radio | 9415va | 11560as | | 1200-1300 | Canada, R Canada Intl | 9660as |
| 1100-1200 vt | Australia, VL8A Alice Spg | 2310do | | | 1200-1300 | Canada, R Canada Intl | 9715me |
| 1100-1200 vt | Australia, VL8K Katherine | 2485do | | | 1200-1300 | Canada, CHNX Halifax | 11835me |
| 1100-1200 vt | Australia, VL8T Tent Crk | 2325do | | | 1200-1300 | Canada, CKZN St John's | 11975me |
| 1100-1200 | Canada, CFRX Toronto | 6070do | | | 1200-1300 | Canada, CKZU Vancouver | 11660as |
| 1100-1200 | Canada, CFVP Calgary | 6030do | | | 1200-1300 | Canada, R Canada Intl | 15195as |
| 1100-1200 | Canada, CHNX Halifax | 6130do | | | 1200-1300 | China, R Canada Intl | 9640am |
| 1100-1200 | Canada, CKZN St John's | 6160do | | | 1200-1300 | China, China Radio Intl | 7385pa |
| 1100-1200 | Canada, CKZU Vancouver | 6160do | | | 1200-1300 | Costa Rica, RF Peace Intl | 9565pa |
| 1100-1200 | Costa Rica, Adv World R | 5030am | 6150am | 7375am | 1200-1230 | Costa Rica, RF Peace Intl | 9715as |
| | | 13750am | | 9725am | 1200-1230 | Croatia, Croatian Radio | 12110as |
| 1100-1200 | Costa Rica, RF Peace Intl | 7385am | 7585am | | 1200-1300 | Cyprus, BRT International | 7385am |
| 1100-1200 | Ecuador, HCJB | 12005am | 15115am | 21455au | 1200-1208 | Ecuador, HCJB | 5920eu |
| 1100-1200 as | Eqt Guinea, R East Africa | 15186af | | | 1200-1300 | Eqt Guinea, R East Africa | 7165eu |
| 1100-1200 | Eqt Guinea, Radio Africa | 9530as | | | 1200-1300 | Eqt Guinea, Radio Africa | 13830na |
| 1100-1150 | Germany, Deutsche Welle | 15370af | 15410af | 17765af | 1200-1300 as | France, Radio France Intl | 12005am |
| 1100-1200 vt | Italy, IRRS | 7125va | | | 1200-1300 | Germany, Universal Life | 15115am |
| 1100-1200 | Japan, R Japan/NHK World | 6120na | 7125na | 11815as | 1200-1300 | Iran, VOIRI | 12455am |
| 1100-1200 | Jordan, Radio | 11690eu | | | 1200-1300 | Italy, IRRS | 15186af |
| 1100-1200 | Lebanon, Voice of Hope | 9960va | | | 1200-1300 | Japan, R Japan/NHK World | 9530as |
| 1100-1110 | Liberia, LCN/R Liberia Int | 5100do | | | 1200-1300 | Jordan, Radio | 7125va |
| 1100-1200 | Malaysia, Radio | 7295do | | | 1200-1300 | Lebanon, Voice of Hope | 9960va |
| 1100-1200 vt | Malaysia, RTM Kuching | 7160do | | | 1200-1300 | Malaysia, Radio | 7295do |
| 1100-1200 vt | Malaysia, RTM KotaKinabalu | 5980do | | | 1200-1300 | Malaysia, RTM KotaKinabalu | 5980do |
| 1100-1129 | Mozambique, Radio | 11812do | | | 1200-1300 | Myanmar, Voice of Netherlands, Radio | 5990do |
| 1100-1125 | Netherlands, Radio | 12065as | 13710as | | 1200-1300 | Myanmar, Voice of Netherlands, Radio | 6045eu |
| 1100-1200 | New Zealand, R NZ Intl | 6100pa | | | 1200-1300 | Myanmar, Voice of Netherlands, Radio | 9860eu |
| 1100-1157 | North Korea, R Pyongyang | 3560na | 6575na | 9640na | 1200-1257 | Portugal, R Portugal | 11830as |
| | | 13560na | 13650na | 9975na | 1200-1257 | Portugal, R Portugal | 11875as |
| 1100-1120 | Pakistan, Radio | 11335na | 15520eu | 17865eu | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1130 as | Palau, KBN/Voice of Hope | 9710va | 15520eu | 17865eu | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1200 vt | Papua New Guinea, NBC | 9730as | | | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1200 | Russia, Voice of Russia WS | 4890do | | | 1200-1257 | Portugal, R Portugal | 15260as |
| | | 4740as | 7330as | 11655as | 1200-1257 | Portugal, R Portugal | 15260as |
| | | 15170as | 15460as | 15490as | 1200-1257 | Portugal, R Portugal | 15260as |
| | | 15510as | 17560as | 17610as | 1200-1257 | Portugal, R Portugal | 15260as |
| | | 17775as | 17795as | 17795as | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1200 | Singapore, R Singapore Int | 6015as | 6155as | | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1130 | Solomon Islands, SIBC | 5020do | | | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1130 | Sri Lanka, Sri Lanka BC | 11835as | 17850as | | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1130 | Switzerland, Swiss R Intl | 13635as | 15415as | 17515as | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1200 | Taiwan, Voice of Asia | 7445as | | | 1200-1257 | Portugal, R Portugal | 15260as |
| | | 5965am | 6190af | 6195va | 1200-1257 | Portugal, R Portugal | 15260as |
| | | 9580as | 11750as | 11760as | 1200-1257 | Portugal, R Portugal | 15260as |
| | | 11955as | 12095eu | 15220am | 1200-1257 | Portugal, R Portugal | 15260as |
| | | 15485va | 15565as | 15575va | 1200-1257 | Portugal, R Portugal | 15260as |
| | | 17705eu | 17830af | 17885af | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1130 as | United Kingdom, BBC WS | 15190am | | | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1130 | United Kingdom, BBC WS | 9700as | 11765va | 15310as | 1200-1257 | Portugal, R Portugal | 15260as |
| 1100-1145 | United Kingdom, BBC WS | 15400af | 17790as | 17785as | 1200-1257 | Portugal, R Portugal | 15260as |

HAUSER'S HIGHLIGHTS
MONGOLIA: VOICE OF MONGOLIA

English schedule:

0900-0930 15170

1240-1310 12085

1500-1530 9720, 12085

1930-2000 9720, 12015

(Hans van den Boogert, Taiwan, hard-core-dx)

Sked by E-mail agrees except 1230-1300, and 12085 not 12015 at 1930 along with 9270, typo? (Andy Sennitt, WRTH via DSWCI DX Window)

12085 had open carrier until 1516, then English (Gatzke, *ibid.*)

1200 UTC

8:00 AM EDT/5:00 AM PDT

SHORTWAVE GUIDE

1300 UTC

9:00 AM EDT/6:00 AM PDT

FREQUENCIES

| | | | | | | | | | | | |
|-------------------|-----------------------------|---------|---------|---------|---------|-------------------|----------------------------|---------|---------|---------|---------|
| 1200-1206 | New Zealand, R NZ Intl | 6100pa | | | | 1300-1310 | Mongolia, Voice of | 12085as | | | |
| 1200-1230 s | Norway, Radio Norway Intl | 9590eu | 13800as | 13805na | 15605au | 1300-1400 occsnal | New Zealand, R NZ Intl | 6100pa | | | |
| 1200-1300 vl | Papua New Guinea, NBC | 4890do | | | | 1300-1357 | North Korea, R Pyongyang | 9345eu | 9640eu | 11740as | 15230as |
| 1200-1255 | Poland, Polish R Warsaw | 6095eu | 7145eu | 7270eu | 9525eu | 1300-1400 vl | Papua New Guinea, NBC | 4890do | | | |
| | | 11815eu | | | | 1300-1400 | Philippines, FEBC/R Intl | 11995as | | | |
| 1200-1300 | Russia, Voice of Russia WS | 4740as | 4975as | 7330as | 11655as | 1300-1356 | Romania, R Romania Intl | 9690eu | 11885eu | 15365eu | 17720eu |
| | | 11785as | 11880as | 15110as | 15170as | 1300-1400 | Russia, Voice of Russia WS | 7330as | 11700as | 15430as | 15460as |
| | | 15230as | 15430as | 15435as | 15490as | | | 15550as | 17610as | 17795as | |
| | | 15510as | 17610as | 17755as | 17775as | 1300-1400 | Singapore, R Singapore Int | 6015as | 6155as | | |
| | | 17795as | | | | 1300-1400 mtwhf | Sri Lanka, Sri Lanka BC | 9730as | | | |
| 1200-1300 | Singapore, R Singapore Int | 6015as | 6155as | | | 1300-1330 | Switzerland, Swiss R Intl | 7230as | 7480as | 13635as | 15120as |
| 1200-1300 | South Korea, R Korea Intl | 7285af | | | | 1300-1330 | | 15415as | 17515as | | |
| 1200-1300 | Switzerland, Swiss R Intl | 6165eu | 9535eu | | | 1300-1400 | Turkey, Voice of | 13695eu | 13750va | 15290as | |
| 1200-1300 | Taiwan, VO Free China | 7130au | 9610as | | | 1300-1400 | United Kingdom, BBC WS | 5990as | 6190af | 9410eu | |
| 1200-1300 | Ukraine, R Ukraine Intl | 6020na | 7150eu | 12045na | 12050na | | | 9515am | 9740va | 11750as | 11760as |
| 1200-1300 | United Kingdom, BBC WS | 6190af | 6195va | 9410eu | 9515am | | | 11865am | 11940af | 12095eu | 15220am |
| | | 9580as | 9740as | 11750as | 11760as | | | 15310as | 15420af | 15485va | 15565as |
| | | 11940af | 11955as | 15220am | 15310as | | | 15575va | 17640va | 17705af | 17830af |
| | | 15485va | 15565va | 15575va | 17640va | | | 17885af | 21470af | 21660af | |
| 1200-1300 | USA, KAIJ Dallas TX | 5810am | | | | 1300-1400 | USA, KAIJ Dallas TX | 13815am | | | |
| 1200-1300 | USA, KTBN Salt Lk City UT | 7510am | | | | 1300-1400 | USA, KNLS Anchor Point AK | 7365as | | | |
| 1200-1300 | USA, KWHR Naaehu HI | 9930as | | | | 1300-1400 | USA, KTBN Salt Lk City UT | 7510am | | | |
| 1200-1300 | USA, Monitor Radio Intl | 6095na | 9355as | 9385au | 9455sa | 1300-1400 | USA, KWHR Naaehu HI | 9930as | | | |
| 1200-1230 | USA, Voice of America | 6160as | 9645as | 9760as | 11715as | 1300-1400 | USA, Monitor Radio Intl | 6095na | 9355as | 9430as | 9455am |
| | | 15160as | 15425as | | | 1300-1400 | USA, Voice of America | 6160as | 9645as | 9760as | 11715as |
| 1200-1300 | USA, WEWN Birmingham AL | 7425sa | | | | 1300-1400 | USA, WEWN Birmingham AL | 7425na | 11875na | 15375as | 15745eu |
| 1200-1300 | USA, WGTG McCaysville GA | 9400am | | | | 1300-1400 | USA, WGTG McCaysville GA | 9400am | | | |
| 1200-1300 | USA, WHRI Noblesville IN | 6040am | 9495am | | | 1300-1400 | USA, WHRI Noblesville IN | 6040am | | 15105am | |
| 1200-1300 | USA, WJCR Upton KY | 7490na | | | | 1300-1400 | USA, WJCR Upton KY | 7490na | | | |
| 1200-1300 | USA, WRM/R Miami Intl | 9955am | | | | 1300-1400 | USA, WRM/R Miami Intl | 9955am | | | |
| 1200-1300 | USA, WRNO New Orleans LA | 7355am | | | | 1300-1400 | USA, WRNO New Orleans LA | 7355am | | | |
| 1200-1300 | USA, WWCR Nashville TN | 5070am | 12160am | 13845am | 15685am | 1300-1400 | USA, WWCR Nashville TN | 9475am | 12160am | 13845am | 15685am |
| 1200-1300 | USA, WYFR Okeechobee FL | 5950na | 6015na | 11830na | 17750na | 1300-1400 | USA, WYFR Okeechobee FL | 5950na | 11830na | 13695na | 17750na |
| 1200-1230 | Uzbekistan, R Tashkent | 7190as | 7285as | 9715as | 15295as | 1300-1400 | Zambia, Christian Voice | 6065af | | | |
| 1200-1300 | Zambia, Christian Voice | 6065af | | | | 1300-1400 | Zambia, R Zambia/ZNBC 1 | 7220do | | | |
| 1200-1300 vl | Zambia, R Zambia/ZNBC 1 | 7220do | | | | 1302-1400 | USA, WYFR Okeechobee FL | 11550as | | | |
| 1207-1300 occsnal | New Zealand, R NZ Intl | 6100pa | | | | 1330-1400 | Canada, R Canada Intl | 9535as | 11795as | 11935eu | 15325me |
| 1215-1300 | Egypt, Radio Cairo | 17595as | | | | 1330-1400 | China, Heilongjiang PBS | 4840do | | | |
| 1215-1300 | United Kingdom, BBC WS | 15220am | | | | 1330-1400 | Guam, AWR/KSDA | 9650as | | | |
| 1230-1255 | Austria, R Austria Intl | 6155eu | 13730na | | | 1330-1400 | India, All India Radio | 9545as | 11620as | 13710as | |
| 1230-1300 | Bangladesh, Bangla Betar | 7185as | 9550as | | | 1330-1400 | Italy, IRRS | 3985va | | | |
| 1230-1255 s | Belgium, R Vlaanderen Int | 13785na | 15535as | | | 1330-1400 | Netherlands, Radio | 9890as | 12090as | 15585as | |
| 1230-1300 mtwhf | Finland, YLE/R Finland | 11900na | 15400na | | | 1330-1400 | Pakistan, Radio | 9485af | 11565af | 15595me | |
| 1230-1300 | Guam, AWR/KSDA | 13720as | | | | 1330-1400 mtwhf | Portugal, R Portugal Intl | 21515as | | | |
| 1230-1235 | India, All India Radio | 4860do | 6150do | 17860do | | 1330-1400 | Sweden, Radio | 11650na | 13740pa | 15240na | |
| 1230-1300 w | Indonesia, RRI Sorong | 4875do | | | | 1330-1355 | UAE, Radio Dubai | 15395eu | 17630eu | 21605me | |
| 1230-1300 | Mongolia, Voice of | 12085as | | | | 1330-1400 | Uzbekistan, R Tashkent | 7190as | 7285as | 9715as | 15295as |
| 1230-1300 | Romania, R Romania Intl | 9690eu | 11885eu | 15365eu | 17720eu | 1330-1400 | Vietnam, Voice of | 5940eu | 7270eu | 7400eu | 9840as |
| 1230-1300 | South Korea, R Korea Intl | 9570as | 9640as | 13670as | | 1335-1345 | Greece, Voice of | 9375eu | 9590na | 15175na | 15630na |
| 1230-1300 mtwhf | Sri Lanka, Sri Lanka BC | 9730as | | | | 1345-1400 | Vatican State, Vatican R | 11625as | 13765au | | |
| 1230-1300 | Sweden, Radio | 13740as | 15240pa | | | 1350-1400 | South Korea, KBS-1 | 3930do | | | |
| 1230-1300 | Thailand, Radio | 9505as | 9655as | 9885as | 11905as | 1355-1400 | Georgia, Voice of Hope | 12120as | | | |
| 1230-1300 | Turkey, Voice of | 13750eu | 15290as | | | 1400-1500 | Anguilla, Caribbean Beacon | 11775am | | | |
| 1230-1300 | Vietnam, Voice of | 5940as | 7270as | 7400as | 9840as | 1400-1500 | Australia, Radio | 5870pa | 5995pa | 9415va | 11800pa |
| 1240-1250 | Greece, Voice of | 11645af | | | | 1400-1500 | Australia, VL8A Alice Spp | 2310do | | | |
| 1300-1400 | Anguilla, Caribbean Beacon | 11775am | | | | 1400-1500 | Australia, VL8K Katherine | 2485do | | | |
| 1300-1400 | Australia, Radio | 5995pa | 6080as | 9580pa | 11800pa | 1400-1500 | Australia, VIBT Tent Crk | 2325do | | | |
| 1300-1330 s | Australia, Radio | 9415va | 11660as | | | 1400-1500 | Canada, CBR N Quebec Svc | 9625do | | | |
| 1300-1400 vl | Australia, VL8A Alice Spp | 2310do | | | | 1400-1500 | Canada, CFRX Toronto | 6070do | | | |
| 1300-1400 vl | Australia, VL8K Katherine | 2485do | | | | 1400-1500 | Canada, CFVP Calgary | 6030do | | | |
| 1300-1400 vl | Australia, VIBT Tent Crk | 2325do | | | | 1400-1500 | Canada, CHNX Halifax | 6130do | | | |
| 1300-1325 mtwhfa | Belgium, R Vlaanderen Int | 13785as | 15535as | | | 1400-1500 | Canada, CKZN St John's | 6160do | | | |
| 1300-1320 | Brazil, Radio Bras | 1545na | | | | 1400-1500 | Canada, CKZU Vancouver | 6160do | | | |
| 1300-1400 vl | Canada, CBC N Quebec Svc | 9625do | | | | 1400-1500 s | Canada, R Canada Intl | 11855am | 13650am | | |
| 1300-1400 | Canada, CFRX Toronto | 6070do | | | | 1400-1500 | China, China Radio Intl | 7160as | 7405na | 9535as | 11825as |
| 1300-1400 | Canada, CFVP Calgary | 6030do | | | | 1400-1500 | Ecuador, HCJB | 12005am | 15115am | 21455am | |
| 1300-1400 | Canada, CHNX Halifax | 6130do | | | | 1400-1500 | Egt Guinea, R East Africa | 15186af | | | |
| 1300-1400 | Canada, CKZN St John's | 6160do | | | | | | | | | |
| 1300-1400 | Canada, CKZU Vancouver | 6160do | | | | | | | | | |
| 1300-1400 mtwhf | Canada, R Canada Intl | 9640am | 11855am | 13650am | | | | | | | |
| 1300-1400 s | Canada, R Canada Intl | 11855am | 13650am | | | | | | | | |
| 1300-1400 | China, China Radio Intl | 6140as | 7385pa | 7405as | 9715as | | | | | | |
| | | 11660pa | 11980as | | | | | | | | |
| 1300-1400 | Costa Rica RF Peace Intl | 7385am | | | | | | | | | |
| 1300-1330 | Czech Rep, Radio Prague | 13580eu | 17485af | | | | | | | | |
| 1300-1400 | Ecuador, HCJB | 12005am | 15115am | 21455am | | | | | | | |
| 1300-1330 | Egypt, Radio Cairo | 17595as | | | | | | | | | |
| 1300-1400 as | Egypt, Radio Cairo | 15186af | | | | | | | | | |
| 1300-1400 | Egt Guinea, R East Africa | 9530as | | | | | | | | | |
| 1300-1330 vl | Egt Guinea, Radio Africa | 7125va | | | | | | | | | |
| 1300-1400 | Italy, IRRS | 11690eu | | | | | | | | | |
| 1300-1400 | Jordan, Radio | 5100do | | | | | | | | | |
| 1300-1310 | Liberia, LCN/R Liberia Int | 7295do | | | | | | | | | |
| 1300-1400 | Malaysia, Radio | 7160do | | | | | | | | | |
| 1300-1400 vl | Malaysia, RTM Kuching | 5980do | | | | | | | | | |
| 1300-1400 vl | Malaysia, RTM Kota Kinabalu | | | | | | | | | | |

MT MONITORING TEAM

Next Reporting Deadline: October 19, 1997

| | | |
|--|--|--|
| Gayle Van Horn | Jim Frimmel | Jacques d'Avignon |
| Frequency Manager | Program Manager | Propagation |
| swbcsesk@grove.net | DXComp@aol.com | Ontario, Canada |
| Dave Datko, CA | Mark Fine, VA | monitor@limestone.kosone.com |

1400 UTC

10:00 AM EDT/7:00 AM PDT

SHORTWAVE GUIDE

1500 UTC

11:00 AM EDT/8:00 AM PDT

M
T

FREQUENCIES

| | | | | | | | |
|------------------|------------------------------|---------|---------|---------|------------------|----------------------------|---------|
| 1400-1457 | France, Radio France Intl | 11910as | 15405me | 17560me | 1500-1515 s | Myanmar, Voice of | 5990do |
| 1400-1500 | Georgia, Voice of Hope | 12120as | | | 1500-1525 | Netherlands, Radio | 9890as |
| 1400-1500 | India, All India Radio | 9545as | 11620as | 13710as | 1500-1600 occsna | New Zealand, R NZ Intl | 6100pa |
| 1400-1430 | Israel, Kol Israel | 12080na | 15650na | | 1500-1600 | Nigeria, Voice of | 7255af |
| 1400-1500 vlfas | Italy, IRRS | 3985va | | | 1500-1557 | North Korea, R Pyongyang | 3560na |
| 1400-1500 | Japan, R Japan/NHK World | 7200eu | | | 1500-1530 s | Norway, Radio Norway Intl | 9325eu |
| 1400-1500 | Jordan, Radio | 11690eu | | | 1500-1530 as | Palau, KHBN/Voice of Hope | 9985as |
| 1400-1500 | Malaysia, Radio | 7295do | | | 1500-1600 vlf | Papua New Guinea, NBC | 4890do |
| 1400-1500 | Malaysia, RTM Kuching | 7160do | | | 1500-1600 | Philippines, FEBC/R Intl | 11995as |
| 1400-1500 vlf | Malaysia, RTM KotaKinabalu | 5980do | | | 1500-1526 | Romania, R Romania Intl | 15335as |
| 1400-1430 | Mexico, Radio Mexico Intl | 9705na | | | 1500-1600 | Russia, Voice of Russia WS | 17720as |
| 1400-1500 | Netherlands, Radio | 9890as | 12090as | 15585as | 1500-1600 | 4740me | 4940me |
| 1400-1500 occsna | New Zealand, R NZ Intl | 6100pa | | | 1500-1600 | 4975me | 7345as |
| 1400-1410 | Pakistan, Radio | 9485af | 9645va | 11565af | 1500-1600 | 9440af | 9595me |
| 1400-1500 vlf | Papua New Guinea, NBC | 4890do | | | 1500-1600 | 9675me | 11775af |
| 1400-1500 | Philippines, FEBC/R Intl | 11995as | | | 1500-1600 | 11835me | 12025af |
| 1400-1500 | Russia, Voice of Russia WS | 4740me | 4940me | 7345as | 1500-1600 | 15203af | 15320me |
| | | 9595me | 9800as | 11665me | 1500-1600 | 15430af | 15540me |
| | | 11985me | 15350me | 11835me | 1500-1600 | 15460me | 17525me |
| | | 15350me | 15430me | 15540me | 1500-1600 | 7325me | 9730eu |
| 1400-1500 | Singapore, R Corp of Sing | 6155do | | | 1500-1600 | Russia, Voice of Russia WS | 9730eu |
| 1400-1500 | Sri Lanka, Sri Lanka BC | 9730as | | | 1500-1600 | Seychelles, FEBA Radio | 9810as |
| 1400-1430 | Thailand, Radio | 9655as | 9830as | 11905as | 1500-1600 | Seychelles, FEBA Radio | 11600as |
| 1400-1410 thfs | Turkmenistan, Turkmen R | 5015eu | | | 1500-1600 | Singapore, R Corp of Sing | 6155do |
| 1400-1500 | United Kingdom, BBC WS | 5990as | 6190af | 6195as | 1500-1600 | United Kingdom, BBC WS | 5975as |
| | | 9515am | 9740as | 11750as | 1500-1600 | 5990as | 6190af |
| | | 11940af | 12095eu | 15220am | 1500-1600 | 9410eu | 6195as |
| | | 15565as | 15575va | 17640va | 1500-1600 | 9515am | 9740as |
| | | 17840am | 21470af | 21660af | 1500-1600 | 9930as | 11750as |
| 1400-1500 | USA, KAIJ Dallas TX | 13815am | | | 1500-1600 | USA, Voice of America | 6160as |
| 1400-1500 | USA, KJES Mesquite NM | 11715na | | | 1500-1600 | 7125as | 7215as |
| 1400-1500 | USA, KTBN Salt Lk City UT | 7510am | | | 1500-1600 | 9760as | 15205as |
| 1400-1500 | USA, Monitor Radio Intl | 9355as | | | 1500-1600 | 15395as | 15255va |
| 1400-1500 | USA, Voice of America | 6160as | 7125as | 7215as | 1500-1600 | USA, WEWN Birmingham AL | 9455na |
| | | 9760as | 15160as | 15225va | 1500-1600 | USA, WGTG McCaysville GA | 9400am |
| | | 15425as | | 15395as | 1500-1600 | USA, WHRI Noblesville IN | 13760am |
| 1400-1500 | USA, WEWN Birmingham AL | 9455na | 11875na | 15745eu | 1500-1600 | USA, WJCR Upton KY | 15105am |
| 1400-1500 | USA, WGTG McCaysville GA | 9400am | | | 1500-1600 | USA, WRMI/R Miami Intl | 9490na |
| 1400-1500 | USA, WHRI Noblesville IN | 6040am | 15105am | | 1500-1600 | USA, WRNO New Orleans LA | 9955am |
| 1400-1500 | USA, WJCR Upton KY | 7490na | | | 1500-1600 | USA, WJCR Nashville TN | 9475am |
| 1400-1500 | USA, WRMI/R Miami Intl | 9955am | | | 1500-1600 | USA, WYFR Okeechobee FL | 12160am |
| 1400-1500 | USA, WRNO New Orleans LA | 7355am | | | 1500-1600 | Zambia, Christian Voice | 11830na |
| 1400-1500 | USA, WWCR Nashville TN | 9475am | 12150am | 13845am | 1500-1600 | Zambia, R Zambia/ZNBC 1 | 4910do |
| 1400-1500 | USA, WYFR Okeechobee FL | 5950na | 11830na | 17750ca | 1500-1600 | Zambia, R Zambia/ZNBC 2 | 6165do |
| 1400-1405 | Vatican State, Vatican R | 11625as | 13755au | | 1515-1530 mtwhf | Estonia, Radio | 5925eu |
| 1400-1500 | Zambia, Christian Voice | 6065af | | | 1530-1545 | India, All India Radio | 6150do |
| 1400-1500 vlf | Zambia, R Zambia/ZNBC 1 | 4910do | | | 1530-1600 | 9835do | 7140do |
| 1415-1430 vlf | Cyprus, BRT International | 6150do | | | 1530-1600 | 9910do | 7410do |
| 1415-1425 | Nepal, Radio | 5005do | 7165do | | 1530-1600 | 9910do | 11740do |
| 1420-1500 as | Palau, KHBN/Voice of Hope | 9985as | | | 1530-1600 | Iran, VOIRI | 11790as |
| 1430-1500 vlf | China, China Radio Intl | 6995as | 8660as | 9880as | 1530-1600 | Seychelles, FEBA Radio | 11600as |
| 1430-1500 | Guam, AWR/KSDA | 7400as | | | 1530-1600 | Sri Lanka, Sri Lanka BC | 9730as |
| 1430-1440 | India, All India Radio | 6150do | 9565do | 9835do | 1545-1600 | Bangladesh, Bangla Betar | 4880do |
| 1430-1440 mtwhf | Indonesia, RRI Uj Pandang | 4753do | | | 1545-1600 | Israel, Kol Israel | 12080va |
| 1430-1500 | Romania, R Romania Intl | 15335as | 17720as | | 1550-1600 | Vatican State, Vatican R | 9940as |
| 1430-1500 vlf | Zambia, R Zambia/ZNBC 2 | 6165do | | | 1600-1700 | Algeria, R Algiers Intl | 13765as |
| 1440-1500 | Myanmar, Voice of | 5990do | | | 1600-1700 | Anguilla, Caribbean Beacon | 15160me |
| 1500-1600 | Anguilla, Caribbean Beacon | 11775am | | | 1600-1700 | Australia, Radio | 11775am |
| 1500-1600 | Australia, Radio | 5870pa | 5995pa | 9415as | 1600-1700 | 9955pa | 5995pa |
| | | 11660as | 11800pa | 9615as | 1600-1700 | 6080pa | 6080pa |
| 1500-1600 vlf | Australia, VL8A Alice Spg | 2310do | | | 1600-1700 | Australia, VL8A Alice Spg | 9415as |
| 1500-1600 vlf | Australia, VL8K Katherine | 2485do | | | 1600-1700 | Australia, VL8K Katherine | 2310do |
| 1500-1600 vlf | Australia, VL8T Tent Crk | 2325do | | | 1600-1700 | Australia, VL8T Tent Crk | 2485do |
| 1500-1600 vlf | Canada, CBC N Quebec Svc | 9625do | | | 1600-1700 | Bangladesh, Bangla Betar | 2325do |
| 1500-1600 | Canada, CFRX Toronto | 6070do | | | 1600-1700 | Canada, CBC N Quebec Svc | 9625do |
| 1500-1600 | Canada, CFVP Calgary | 6030do | | | 1600-1700 | Canada, CFRX Toronto | 9625do |
| 1500-1600 | Canada, CHNX Halifax | 6130do | | | 1600-1700 | Canada, CFVP Calgary | 6030do |
| 1500-1600 | Canada, CKZN St John's | 6160do | | | 1600-1700 | Canada, CHNX Halifax | 6130do |
| 1500-1600 | Canada, CKZU Vancouver | 6160do | | | 1600-1700 | Canada, CKZN St John's | 6160do |
| 1500-1600 | Canada, CKZU Vancouver | 6160do | | | 1600-1700 | Canada, CKZU Vancouver | 6160do |
| 1500-1600 s | Canada, R Canada Intl | 11855am | 13650am | | 1600-1700 | China, China Radio Intl | 9565as |
| 1500-1600 | China, China Radio Intl | 7160as | 9785as | | 1600-1700 | Costa Rica, Adw World R | 15110af |
| 1500-1600 | Costa Rica, RF Peace Intl | 7385am | 15050am | | 1600-1700 | Costa Rica, RF Peace Intl | 15130af |
| 1500-1600 | Ecuador, HCJB | 12005am | 15115am | 21455am | 1600-1654 | Czech Rep, Radio Prague | 15650va |
| 1500-1600 as | Egypt, Guinea, R East Africa | 15186af | | | 1600-1650 | Ethiopia, Radio | 5930eu |
| 1500-1600 | Georgia, Voice of Hope | 12120as | | | 1600-1650 | France, Radio France Intl | 7165af |
| 1500-1600 | Guam, TWR/KTWR | 11580as | | | 1600-1650 | Germany, Deutsche Welle | 11615me |
| 1500-1600 a | Ireland, W Coast R Ireland | 6175eu | | | 1600-1650 | Guam, TWR/KTWR | 11700af |
| 1500-1525 | Israel, Kol Israel | 9435eu | 11695as | 15640ca | 1600-1650 | Iran, VOIRI | 11790as |
| 1500-1600 vlfas | Italy, IRRS | 3985va | | | 1600-1650 | Italy, IRRS | 11790as |
| 1500-1600 | Japan, R Japan/NHK World | 7200af | 7240af | 9535na | 1600-1650 | Jordan, Radio | 11690eu |
| | | 11730af | 15355af | 9750as | 1600-1650 | Lesotho, Radio Lesotho | 11690eu |
| 1500-1600 | Jordan, Radio | 11690eu | | | 1600-1650 | Malaysia, Radio | 12090as |
| 1500-1510 | Liberia, LCN/R Liberia Int | 5100do | | | 1600-1650 | New Zealand, R NZ Intl | 15585as |
| 1500-1600 | Malaysia, Radio | 7295do | | | 1600-1650 | Nigeria, Voice of | 16100pa |
| 1500-1600 vlf | Malaysia, RTM Kuching | 7160do | | | 1600-1650 | Pakistan, Radio | 12035af |
| 1500-1600 vlf | Malaysia, RTM KotaKinabalu | 5980do | | | 1600-1650 | Papua New Guinea, NBC | 15570af |
| 1500-1530 | Mexico, Radio Mexico Intl | 9705na | | | 1600-1650 | Russia, Voice of Russia WS | 15957eu |
| 1500-1530 | Mongolia, Voice of | 9720as | 12085au | | 1600-1650 | Russia, Voice of Russia WS | 15957eu |

FREQUENCIES

| | | | | | | | | | | |
|-----------------|----------------------------|---------|---------|---------|---------|-----------------|----------------------------|---------|---------|---------|
| 11725af | 9775eu | 9440af | 9615af | 9730eu | 9765eu | 1700-1730 | Spain, R Exterior Espana | 9620eu | | |
| 12025af | 11775af | 9880eu | 9975af | 11685af | | 1700-1800 | Swaziland, Trans World R | 9500af | | |
| 17875af | 15350af | 11850af | 11945af | | | 1700-1730 | Switzerland, Swiss R Intl | 9905eu | | |
| 1600-1630 | S Africa, Channel Africa | 6120af | 9685af | | | 1700-1800 | United Kingdom, BBC WS | 3255af | 5975as | 6090va |
| 1600-1700 | Singapore,R Corp of Sing | 6155do | | | | | | 6190af | | |
| 1600-1700 | South Korea, R Korea Intl | 5975eu | 9515af | 9870af | | 1700-1745 | United Kingdom, BBC WS | 3915as | | |
| 1600-1700 | Swaziland, Trans World R | 9500af | | | | 1700-1800 | USA, KAIJ Dallas TX | 13815am | | |
| 1600-1630 | Switzerland, Swiss R Intl | 12075as | 13635as | 15530as | | 1700-1800 | USA, KTBN Salt Lk City UT | 15590am | | |
| 1600-1640 | UAE, Radio Dubai | 15395me | 17630eu | | | 1700-1800 | USA, KWHR Naalehu HI | 9930as | | |
| 1600-1700 | United Kingdom, BBC WS | 3255af | 3915as | 5975as | 6190af | 1700-1800 | USA, Voice of America | 6110as | 6160as | 7125as |
| | | 7160as | 7275as | 9410eu | 11750as | | | 9645as | 9700me | 7170as |
| | | 12095eu | 15400af | 15485eu | 15565me | | | 15395as | 15445af | 15255va |
| | | 15575va | 17830af | 17840am | 21470af | | | 17895af | | |
| | | 21660af | | | | 1700-1800 mtwhf | USA, Voice of America | 5990as | 6045as | 7150as |
| 1600-1615 | United Kingdom, BBC WS | 5990as | 6195as | 9515am | 9740as | 1700-1800 | USA, WEWN Birmingham AL | 9770as | 11870as | 15135as |
| 1600-1700 | USA, KAIJ Dallas TX | 13815am | | | | 1700-1800 | USA, WGTV McCaysville GA | 11875na | 13615na | 15745eu |
| 1600-1700 | USA, KTBN Salt Lk City UT | 15590am | | | | 1700-1800 | USA, WHRI Noblesville IN | 9400am | | |
| 1600-1700 | USA, KWHR Naalehu HI | 9930as | | | | 1700-1800 | USA, WINB Red Lion PA | 9495am | 13760am | |
| 1600-1700 | USA, Voice of America | 6035af | 6110as | 6160as | 7125as | 1700-1800 | USA, WJCR Upton KY | 15715af | | |
| | | 7215as | 9645as | 9700me | 9760as | 1700-1800 | USA, WMLK Bethel PA | 7490na | | |
| | | 13600af | 13710af | 15205va | 15225af | 1700-1800 mtwhf | USA, WMLK Bethel PA | 9465eu | | |
| | | 15255va | 15395as | 15410af | 15445af | 1700-1800 | USA, WRMI/R Miami Intl | 9955am | | |
| | | 17895af | | | | 1700-1800 | USA, WRNO New Orleans LA | 7355am | | |
| 1600-1700 | USA, WEWN Birmingham AL | 11875na | 13615na | 15745eu | | 1700-1800 | USA, WWCR Nashville TN | 9475am | 12160am | 13845am |
| 1600-1700 | USA, WGTV McCaysville GA | 9400am | | | | 1700-1800 | USA, WYFR Okeechobee FL | 11550as | 15695eu | 21745eu |
| 1600-1700 | USA, WHRI Noblesville IN | 13760am | 15105am | | | 1700-1800 | Zambia, Christian Voice | 3330af | | |
| 1600-1700 | USA, WJCR Upton KY | 7490na | | | | 1700-1800 vl | Zambia, R Zambia/ZNBC 1 | 4910do | | |
| 1600-1700 mtwhf | USA, WMLK Bethel PA | 9465eu | | | | 1700-1800 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | |
| 1600-1700 | USA, WRMI/R Miami Intl | 9955am | | | | 1700-1800 vl | Zimbabwe, Zimbabwe BC | 4828do | | |
| 1600-1700 | USA, WRNO New Orleans LA | 7355am | | | | 1730-1800 vl | Cyprus, BRT International | 6150do | | |
| 1600-1700 | USA, WWCR Nashville TN | 9475am | 12160am | 13845am | 15685am | 1730-1800 mtwhf | Georgia, Radio | 6080eu | | |
| 1600-1700 | USA, WYFR Okeechobee FL | 11550as | 11705na | 11830na | 15695eu | 1730-1800 | Guam, AWR/KSDA | 9370as | | |
| | | 17750eu | 21525af | 21745eu | | 1730-1800 | Netherlands, Radio | 6020af | 7120af | 11655af |
| 1600-1610 | Vatican State, Vatican R | 9940as | 11635as | | | 1730-1800 | Philippines, R Pilipinas | 11720me | 11890me | 15190me |
| 1600-1630 | Vatican State, Vatican R | 4005eu | 5882eu | 7250eu | 9645eu | 1730-1756 | Romania, R Romania Intl | 9550af | 11940af | 15340af |
| | | 11810eu | | | | 1730-1800 mtwh | Swaziland, Trans World R | 3200af | | |
| 1600-1630 | Vietnam, Voice of | 9840af | 15010af | | | 1730-1800 | Sweden, Radio | 6065eu | 13800va | |
| 1600-1700 | Zambia, Christian Voice | 3330af | 4965af | | | 1730-1800 s | Sweden, Radio | 9590eu | 13800va | |
| 1600-1700 vl | Zambia, R Zambia/ZNBC 1 | 4910do | | | | 1730-1759 | Vatican State, Vatican R | 11625af | 15570af | 17550af |
| 1600-1700 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | | | 1745-1800 | Bangladesh, Bangla Betar | 7190as | 9570eu | 15520do |
| 1610-1615 | Bangladesh, Bangla Betar | 4880do | | | | 1745-1800 | India, All India Radio | 7410eu | 9950eu | 11620af |
| 1615-1700 as | United Kingdom, BBC WS | 9515am | 11860af | 15420af | | | | 13780do | 15075af | 11935af |
| 1630-1655 | Austria, R Austria Intl | 6155eu | 9655eu | 11855me | 13710as | 1745-1800 | Swaziland, Trans World R | 3200af | | |
| | | 13730af | | | | 1755-1800 | Georgia, Voice of Hope | 9310eu | | |
| 1630-1657 | Canada, R Canada Intl | 7150as | 9550as | | | 1800-1900 | Anguilla, Caribbean Beacon | 11775am | | |
| 1630-1700 | Egypt, Radio Cairo | 15255af | | | | 1800-1900 | Australia, Radio | 6080as | 9415va | 9615as |
| 1630-1700 | Georgia, Radio | 6180eu | | | | 1800-1900 vl | Australia, VL8A Alice Spg | 2310do | | |
| 1630-1700 | Slovakia, AWR Europe | 11600af | 13580me | | | 1800-1900 vl | Australia, VL8K Katherine | 2485do | | |
| 1630-1700 | Slovakia, R Slovakia Intl | 5915eu | 6055eu | 7345eu | | 1800-1900 vl | Bangladesh, Bangla Betar | 7190eu | 9570as | 15520do |
| 1645-1700 irreg | Afghanistan, Radio | 7200as | | | | 1800-1825 mtwhf | Belgium, R Vlaanderen Int | 5910eu | 13645af | |
| 1645-1700 | Tajikistan, Radio Dushanbe | 7245as | 9905as | | | 1800-1900 | Brazil, Radio Bras | 15265eu | | |
| 1650-1700 | Eqt Guinea, Radio Africa | 15186af | | | | 1800-1900 | Canada, CFRX Toronto | 6070do | | |
| 1650-1700 mtwhf | New Zealand, R NZ Intl | 6145pa | | | | 1800-1900 | Canada, CFVP Calgary | 6030do | | |
| 1700-1800 | Anguilla, Caribbean Beacon | 11775am | 6080pa | 6355va | 9415va | 1800-1900 | Canada, CHNX Halifax | 6130do | | |
| 1700-1800 | Australia, Radio | 9615as | 11880pa | | | 1800-1900 | Canada, CKZN St John's | 6160do | | |
| | | | | | | 1800-1900 | Canada, CKZU Vancouver | 6160do | | |
| 1700-1800 vl | Australia, VL8A Alice Spg | 2310do | | | | 1800-1900 | Costa Rica, RF Peace Intl | 15050am | | |
| 1700-1800 vl | Australia, VL8K Katherine | 2485do | | | | 1800-1900 | Croatia, Croatian Radio | 5895eu | 7165eu | 9595va |
| 1700-1800 vl | Australia, VL8T Tent Crk | 2325do | | | | 1800-1830 | Egypt, Radio Cairo | 15255af | | 13830na |
| 1700-1800 vl | Canada, CBC N Quebec Svc | 9625do | | | | 1800-1900 | Eqt Guinea, Radio Africa | 15186af | | |
| 1700-1800 | Canada, CFRX Toronto | 6070do | | | | 1800-1900 | Georgia, Voice of Hope | 9310eu | | |
| 1700-1800 | Canada, CFVP Calgary | 6030do | | | | 1800-1900 | India, All India Radio | 7410eu | 9650eu | 9950af |
| 1700-1800 | Canada, CHNX Halifax | 6130do | | | | 1800-1900 | Canada, CHNX Halifax | 6070do | | 11620af |
| 1700-1800 | Canada, CKZN St John's | 6160do | | | | 1800-1900 | Canada, CKZU Vancouver | 6160do | | |
| 1700-1800 | Canada, CKZU Vancouver | 6160do | | | | 1800-1900 vl | Costa Rica, RF Peace Intl | 15050am | | |
| 1700-1800 | China, China Radio Intl | 5220af | 7150af | 7160af | 7405af | 1800-1900 | Croatia, Croatian Radio | 5895eu | 7165eu | 9595va |
| | | 9570af | 11910af | | | 1800-1900 | Egypt, Radio Cairo | 15255af | | |
| 1700-1800 | Costa Rica, RF Peace Intl | 15050am | | | | 1800-1900 s | Eqt Guinea, Radio Africa | 15186af | | |
| 1700-1727 | Czech Rep, Radio Prague | 5930eu | 15640af | | | 1800-1825 | Georgia, Voice of Hope | 9310eu | | |
| 1700-1800 | Egypt, Radio Cairo | 15255af | | | | 1800-1851 mtwhf | India, All India Radio | 7410eu | 9650eu | 9950af |
| 1700-1800 | Eqt Guinea, Radio Africa | 15186af | | | | 1800-1851 s | New Zealand, R NZ Intl | 11935me | 13770as | 13780as |
| 1700-1730 | France, Radio France Intl | 15210af | 15460me | | | 1800-1900 vl | Norway, Radio Norway Intl | 7485eu | 9590me | 15220af |
| 1700-1800 | Georgia, Voice of Hope | 9310eu | | | | 1800-1900 vl | Papua New Guinea, NBC | 4890do | | |
| 1700-1800 vl | Italy, IRRS | 3985va | | | | 1800-1900 vl | Philippines, R Pilipinas | 11720me | 11890me | 15190me |
| 1700-1800 | Japan, R Japan/NHK World | 6035na | 7110na | 7200na | 7225na | 1800-1900 | Russia, Voice of Russia WS | 7290eu | 7295af | 7350eu |
| | | 9535na | 9835na | 11730as | 11880as | | | 9686eu | 9775eu | 9810eu |
| 1700-1800 mtwhf | New Zealand, R NZ Intl | 6145pa | | | | | | 9886eu | 9880eu | 9945eu |
| 1700-1757 | North Korea, R Pyongyang | 9325eu | 9640eu | 9975af | 13785me | 1800-1900 as | S Africa, World Music R | 3345eu | 6290af | |
| 1700-1800 vl | Papua New Guinea, NBC | 4890do | | | | 1800-1900 | Sudan, Radio Omdurman | 9200af | | |
| 1700-1755 | Poland, Polish R Warsaw | 6000eu | 6095eu | 7285eu | | 1800-1900 | Swaziland, Trans World R | 3200af | | |
| 1700-1800 | Russia, Voice of Russia WS | 7440af | 9440af | 9765eu | 9775eu | 1800-1830 | Swaziland, Trans World R | 9500af | | |
| | | 9865eu | 9880eu | 9945af | 11775af | 1800-1900 | United Kingdom, BBC WS | 3255af | 6180eu | 6190af |
| | | 17875af | | | | | | 9410va | 12095eu | 15400af |
| 1700-1730 | S Africa, Channel Africa | 11900af | | | | 1800-1830 | United Kingdom, BBC WS | 5975as | 6090va | 6195eu |
| 1700-1730 | Slovakia, AWR Europe | 15620af | | | | | | 15485va | 17830af | 21490af |

1800 UTC

2:00 PM EDT/11:00 AM PDT

SHORTWAVE GUIDE

1900 UTC

3:00 PM EDT/12:00 M PDT

FREQUENCIES

| | | | | | | | | | | |
|-------------------|----------------------------|---------|---------|---------|------------------|----------------------------|---------|---------|---------|---------|
| 1800-1900 | USA, KAIJ Dallas TX | 13815am | | | 1900-2000 | Romania, R Romania Intl | 7105af | 7195eu | 9550eu | 9690eu |
| 1800-1900 | USA, KJES Mesquite NM | 15385na | | | 1900-2000 | Russia, Voice of Russia WS | 11810eu | 11940af | | |
| 1800-1900 | USA, KTBN Salt Lk City UT | 15590am | | | | | 7290eu | 7350eu | 7440eu | 9440af |
| 1800-1900 | USA, KWHR Naalehu HI | 13625as | | | | | 9775eu | 9810eu | 9865eu | 9945af |
| 1800-1900 | USA, Monitor Radio Intl | 9385af | 13770eu | 15665eu | 1900-2000 as | S Africa, World Music R | 3345eu | | | |
| 1800-1900 | USA, Voice of America | 7415af | 9760af | 11975af | 1900-1930 | Serbia, R Yugoslavia | 7230au | | | |
| | | 15580af | 17895af | | 1900-2000 | South Korea, R Korea Intl | 5975eu | | | |
| 1800-1900 | USA, WEWN Birmingham AL | 11875na | 13615na | 15745eu | 1900-1920 | Swaziland, Trans World R | 3200af | | | |
| 1800-1900 | USA, WG TG McCaysville GA | 9400am | | | 1900-2000 | Switzerland, Swiss R Intl | 6165eu | | | |
| 1800-1900 | USA, WHRI Noblesville IN | 9495am | 13760eu | | 1900-2000 | Thailand, Radio | 7210eu | 9655eu | | |
| 1800-1900 | USA, WINB Red Lion PA | 15715af | | | 1900-1930 | Turkey, Voice of | 9445eu | 13695na | | |
| 1800-1900 | USA, WJCR Upton KY | 7490na | | | 1900-2000 | United Kingdom, BBC WS | 3255af | 6005af | 6180eu | 6190af |
| 1800-1900 smtwhf | USA, WMLK Bethel PA | 9465eu | | | | | 6195va | 9410af | 9630af | 9740as |
| 1800-1900 as | USA, WRMI/R Miami Intl | 9955am | | | | | 11835af | 12095eu | 15400af | 15485va |
| 1800-1900 | USA, WRNO New Orleans LA | 7355am | | | | | 15575va | 17830af | | |
| 1800-1900 | USA, WWCR Nashville TN | 9475am | 12160am | 13845am | 1900-2000 | USA, KAIJ Dallas TX | 13815am | | | |
| 1800-1900 | USA, WYFR Okeechobee FL | 15695eu | 17555eu | | 1900-2000 | USA, KTBN Salt Lk City UT | 15590am | | | |
| 1800-1827 | Vietnam, Voice of | 9840eu | 15010eu | | 1900-2000 | USA, KWHR Naalehu HI | 13625as | | | |
| 1800-1900 | Yemen, Radio Aden | 9780do | | | 1900-2000 | USA, Monitor Radio Intl | 9385af | 13770eu | 15665eu | 17510af |
| 1800-1900 | Zambia, Christian Voice | 3330af | 4965af | | 1900-2000 | USA, Voice of America | 6035af | 7325af | 7415af | 9525pa |
| 1800-1900 vl | Zambia, R Zambia/ZNBC 1 | 4910do | | | 1900-2000 | | 9760af | 11870pa | 11975af | 15180pa |
| 1800-1900 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | | | | 15410af | 15445af | 15580af | |
| 1800-1900 vl | Zimbabwe, Zimbabwe BC | 4828do | | | | | | | | |
| 1805-1830 | Malawi, MBC | 5993do | | | 1900-1930 s | USA, Voice of America | 4950af | | | |
| 1825-1900 vl | Cyprus, BRT International | 6150do | | | 1900-2000 | USA, WEWN Birmingham AL | 11875na | | | |
| 1830-1900 t | Belarus, Radiosta Belarus | 6010eu | 7105eu | 7205eu | 1900-2000 | USA, WG TG McCaysville GA | 9400am | | | |
| 1830-1900 | Georgia, Radio | 11910eu | | | 1900-2000 | USA, WHRI Noblesville IN | 9495am | 13760eu | | |
| 1830-1900 | Netherlands, Radio | 6020af | 7120af | 9895af | 1900-2000 | USA, WINB Red Lion PA | 15715eu | | | |
| | | 15315af | 17605af | | 1900-2000 | USA, WJCR Upton KY | 7490na | | | |
| 1830-1900 w | Saipan, FEBC/KFBS | 9465as | | | 1900-2000 smtwhf | USA, WMLK Bethel PA | 9465eu | | | |
| 1830-1900 a | Serbia, R Yugoslavia | 6100eu | 9720af | | 1900-2000 | USA, WRMI/R Miami Intl | 9955am | | | |
| 1830-1900 | Slovakia, R Slovakia Intl | 5915eu | 6055eu | 7345eu | 1900-2000 | USA, WRNO New Orleans LA | 7355am | | | |
| 1830-1835 | Somalia, Radio Mogadishu | 6732do | | | 1900-2000 | USA, WWCR Nashville TN | 9475am | 12160am | 13845am | 15685am |
| 1830-1900 | Turkey, Voice of | 9445eu | 13695na | | 1900-2000 | USA, WYFR Okeechobee FL | 17555af | | | |
| 1830-1900 | United Kingdom, BBC WS | 6005af | 9630af | | 1900-1927 | Vietnam, Voice of | 9840eu | 15010eu | | |
| 1830-1900 | USA, Voice of America | 7170as | 7330af | 9860af | 1900-2000 | Zambia, Christian Voice | 3330af | 4965af | | |
| 1833-1900 | Cote D'Ivoire, RDTV | 11920do | | | 1900-2000 vl | Zambia, R Zambia/ZNBC 1 | 4910do | | | |
| 1840-1850 | Greece, Voice of | 11645af | 11730na | 15150af | 1900-2000 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | | |
| 1845-1900 | Albania, R Tirana Intl | 7270eu | 9570eu | | 1900-2000 vl | Zimbabwe, Zimbabwe BC | 4828do | | | |
| 1845-1900 mtwhf | Armenia, Voice of | 4810eu | 4990me | | 1900-1955 | Germany, VO Mediterranean | 12060eu | | | |
| 1845-1900 irreg s | Mali, RDTV Malienne | 4783do | 4835do | 5995do | 1930-2000 | Georgia, Radio | 11760eu | | | |
| 1852-1900 smtwhf | New Zealand, R NZ Intl | 9875pa | | | 1930-2000 | Iran, VOIRI | 7290eu | 9022eu | | |
| 1900-2000 | Anguilla, Caribbean Beacon | 11775am | | | 1930-2000 | Mongolia, Voice of | 9720as | 12015as | | |
| 1900-2000 mtwhf | Argentina, RAE | 15345eu | | | 1930-2000 | Poland, Polish R Warsaw | 6035eu | 6095eu | 7285eu | |
| 1900-2000 | Australia, Radio | 6080pa | 6355va | 7240pa | 1930-2000 | Sweden, Radio | 6065eu | | | |
| | | 9615as | 11880pa | 9415va | 1935-1955 | Italy, RAI Intl | 6015eu | 7230eu | 9670eu | |
| 1900-2000 vl | Australia, VL8A Alice Spg | 2310do | | | 1950-2000 | Vatican State, Vatican R | 4005eu | 5882eu | 7250eu | 9645eu |
| 1900-2000 vl | Australia, VL8K Katherine | 2485do | | | 1952-2000 fa | New Zealand, R NZ Intl | 9875pa | | | |
| 1900-2000 vl | Australia, VL8T Tent Crk | 2325do | | | 2000-2100 | Algeria, R Algiers Intl | 15160af | | | |
| 1900-1920 | Brazil, Radio Bras | 15265eu | | | 2000-2100 | Angola, Radio Nacional | 3355do | 9535do | | |
| 1900-2000 | Bulgaria, Radio | 9700eu | 11720eu | | 2000-2100 | Anguilla, Caribbean Beacon | 11775am | | | |
| 1900-2000 | Canada, CFRX Toronto | 6070do | | | 2000-2100 | Australia, Radio | 9415va | 9615as | 11880pa | |
| 1900-2000 | Canada, CFVP Calgary | 6030do | | | 2000-2100 | Australia, VL8A Alice Spg | 2310do | | | |
| 1900-2000 | Canada, CHNX Halifax | 6130do | | | 2000-2100 | Australia, VL8K Katherine | 2485do | | | |
| 1900-2000 | Canada, CKZN St John's | 6160do | | | 2000-2100 | Australia, VL8T Tent Crk | 2325do | | | |
| 1900-2000 | Canada, CKZU Vancouver | 6160do | | | 2000-2100 | Canada, CFRX Toronto | 6070do | | | |
| 1900-2000 | China, China Radio Intl | 6955af | 9440af | 11515af | 2000-2100 | Canada, CFVP Calgary | 6030do | | | |
| 1900-2000 | Costa Rica, RF Peace Intl | 15050am | | | 2000-2100 | Canada, CHNX Halifax | 6130do | | | |
| 1900-1930 | Cote D'Ivoire, RDTV | 11920do | | | 2000-2100 | Canada, CKZN St John's | 6160do | | | |
| 1900-1908 | Croatia, Croatian Radio | 5895eu | 7165eu | 9595va | 2000-2100 | Canada, CKZU Vancouver | 6160do | | | |
| 1900-2000 vl | Cyprus, BRT International | 6150do | | | 2000-2100 | Canada, R Canada Intl | 5995va | 7235eu | 11690af | 13650af |
| 1900-2000 | Ecuador, HCJB | 12015am | 21455am | | 2000-2100 | Cyprus, BRT International | 6150do | | | |
| 1900-2000 | Eqt Guinea, Radio Africa | 15186af | | | 2000-2027 | Czech Rep, Radio Prague | 5930eu | 11600au | | |
| 1900-1930 m | Estonia, Radio | 5925eu | | | 2000-2100 | Ecuador, HCJB | 12015eu | 21455am | | |
| 1900-2000 | Georgia, Voice of Hope | 9310eu | | | 2000-2100 | Eqt Guinea, Radio Africa | 15186af | | | |
| 1900-1950 | Germany, Deutsche Welle | 7250af | 9640af | 9670af | 2000-2100 | | | | | |
| | | 11785af | 11810af | 13790af | 2000-2100 | | | | | |
| 1900-2000 | Guatemala, Adv World R | 5980am | | | 2000-2100 | | | | | |
| 1900-1930 | Hungary, Radio Budapest | 3975eu | 7155eu | 9755eu | 2000-2100 | | | | | |
| 1900-1945 | India, All India Radio | 7410eu | 9650eu | 9950me | 2000-2100 | | | | | |
| | | 11935af | 13770as | 13780as | 2000-2100 | | | | | |
| 1900-2000 h | Ireland, W Coast R Ireland | 15625af | | | 2000-2100 | | | | | |
| 1900-1925 | Israel, Kol Israel | 7465na | 9435na | 11605va | 2000-2100 | | | | | |
| 1900-2000 vl | Italy, IRRS | 3985va | | | 2000-2100 | | | | | |
| 1900-2000 vl | Kenya, Kenya Broad Corp | 4885do | 4935do | 6150do | 2000-2027 | | | | | |
| 1900-2000 | Kuwait, Radio | 11990eu | | | 2000-2100 | | | | | |
| 1900-1930 as | Latvia, Radio | 5935eu | | | 2000-2100 | | | | | |
| 1900-1915 | Liberia, LCN/R Liberia Int | 5100do | | | 2000-2100 | | | | | |
| 1900-2000 smtwha | Malta, VO Mediterranean | 9765eu | 9810am | 12060me | 2000-2100 | | | | | |
| 1900-1930 | Mexico, Radio Mexico Intl | 9705na | | | 2000-2100 | | | | | |
| 1900-2000 | Netherlands, Radio | 6020af | 7120af | 9895af | 2000-2100 | | | | | |
| | | 15315af | 17605af | | 2000-2100 | | | | | |
| 1900-2000 smtwh | New Zealand, R NZ Intl | 9875pa | | | 2000-2100 | | | | | |
| 1900-2000 | Nigeria, Voice of | 7255af | | | 2000-2100 | | | | | |
| 1900-1957 | North Korea, R Pyongyang | 6520as | 9600af | 9975af | 2000-2100 | | | | | |
| 1900-2000 vl | Papua New Guinea, NBC | 4890do | | | 2000-2100 | | | | | |
| 1900-1930 vl | Philippines, R Pilipinas | 11720me | 11890me | 15190me | 2000-2100 | | | | | |

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FREQUENCIES

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|------------------|----------------------------|---------|---------|---------|-----------------|----------------------------|---------|---------|---------|
| 2000-2030 | Finland, YLE/R Finland | 6120eu | 9855eu | | 2100-2200 vl | Australia, VL8T Tent Crk | 4910do | | |
| 2000-2007 | Georgia, Voice of Hope | 9310eu | | | 2100-2125 | Belgium, R Vlaanderen Int | 5910eu | | |
| 2000-2050 | Germany, Deutsche Welle | 7170eu | | | 2100-2200 | Bulgaria, Radio | 9700eu | 11720eu | |
| 2000-2030 | Ghana, Ghana Broadc Corp | 3366do | 4915do | 11730na | 2100-2115 vl | Cameroon, Radio Cameroon | 4850do | | |
| 2000-2010 | Greece, Voice of | 7430eu | 9380eu | 17745na | 2100-2200 vl | Cameroon, Radio Garoua | 5010do | | |
| 2000-2100 | Guatemala, Adv World R | 5980am | | | 2100-2200 vl | Canada, CBC N Quebec Svc | 9625do | | |
| 2000-2100 | Indonesia, Voice of | 9525as | | | 2100-2200 | Canada, CFRX Toronto | 6070do | | |
| 2000-2030 | Iran, VOIRI | 7260eu | 9022eu | | 2100-2200 | Canada, CFVP Calgary | 6030do | | |
| 2000-2100 vl | Italy, IRRS | 3955va | | | 2100-2200 | Canada, CHNX Halifax | 6130do | | |
| 2000-2100 vl | Kenya, Kenya Broadc Corp | 4885do | 4935do | 6150do | 2100-2200 | Canada, CKZN St John's | 6160do | | |
| 2000-2100 | Kuwait, Radio | 11990eu | | | 2100-2200 | Canada, CKZU Vancouver | 6160do | | |
| 2000-2030 | Mexico, Radio Mexico Intl | 9705na | | | 2100-2130 | Canada, R Canada Intl | 11690af | 13650af | 13670af |
| 2000-2025 | Netherlands, Radio | 6020af | 7120af | 9895af | 2100-2130 | Canada, R Canada Intl | 15325af | 17820af | 15150af |
| | | 15315af | 17605af | | 2100-2130 mtwhf | Canada, R Canada Intl | 5995eu | 7235eu | |
| 2000-2051 smtwh | New Zealand, R NZ Intl | 9875pa | | | 2100-2130 | China, China Radio Intl | 3985eu | 5220eu | 6950eu |
| 2000-2058 a | New Zealand, R NZ Intl | 9875pa | | | | | 11715af | 15110af | 9920eu |
| 2000-2100 f | New Zealand, R NZ Intl | 9875pa | | | 2100-2200 | Costa Rica, RF Peace Intl | 15050am | | |
| 2000-2005 | Nigeria, FRCN/Radio | 3326do | 4770do | 4990do | 2100-2108 | Croatia, Croatian Radio | 5895va | 7165eu | 11635na |
| 2000-2057 | North Korea, R Pyongyang | 6575eu | 9345eu | 9640af | 2100-2130 | Cuba, Radio Havana | 13715eu | 13725eu | |
| 2000-2100 vl | Papua New Guinea, NBC | 4890do | | | 2100-2200 vl | Cyprus, BRT International | 6150do | | |
| 2000-2025 | Poland, Polish R Warsaw | 6035eu | 6095eu | 7285eu | 2100-2200 | Ecuador, HCJB | 12015eu | 21455am | |
| 2000-2030 mtwhf | Portugal, R Portugal Intl | 7110eu | 9780eu | 9815eu | 2100-2200 | Egypt, Radio Cairo | 15375af | | |
| 2000-2100 | Russia, Voice of Russia WS | 7350eu | 7370eu | 7440eu | 2100-2200 | Egt Guinea, Radio Africa | 15186af | | |
| | | 9665eu | 9775eu | 9810eu | 2100-2150 | Germany, Deutsche Welle | 7115au | 9670as | 9735af |
| | | 13815eu | | | | | 11785au | 11865af | 9765as |
| 2000-2100 as | S Africa, World Music R | 3345eu | 6290af | | 2100-2130 | Germany, Adventist World R | 9830af | | |
| 2000-2015 | Sierra Leone, SLBS | 3316do | | | 2100-2130 | Hungary, Radio Budapest | 3975eu | 7250eu | 9835eu |
| 2000-2015 irreg | Somalia, Radio Mogadishu | 6870af | | | 2100-2200 | India, All India Radio | 7150eu | 7410eu | 9910eu |
| 2000-2100 mtwhf | Spain, R Exterior Espana | 6125eu | 11775af | | 2100-2130 | Iran, VOIRI | 6165pa | 6175pa | |
| 2000-2015 | Swaziland, Trans World R | 3200af | | | 2100-2200 vl | Italy, IRRS | 3955va | | |
| 2000-2030 | Switzerland, Swiss R Intl | 9885af | 12075af | 13635af | 2100-2100 | Japan, R Japan/NHK World | 6035as | 9535na | 13630as |
| 2000-2015 | Uganda, Radio | 4976do | | | 2100-2107 vl | Kenya, Kenya Broadc Corp | 4885do | 4935do | 6150do |
| 2000-2100 | United Kingdom, BBC WS | 3255af | 5975as | 6005af | 2100-2200 | Lebanon, Voice of Hope | 9960va | | |
| | | 6190af | 6195va | 9410eu | 2100-2115 | Liberia, LCN/R Liberia Int | 5100do | | |
| | | 11750am | 11835af | 12095eu | 2100-2107 | Namibia, NBC | 3270do | 3290do | |
| 2000-2100 | USA, KAIJ Dallas TX | 13815am | | | 2100-2200 smtwh | New Zealand, R NZ Intl | 11735pa | | |
| 2000-2100 | USA, KBTN Salt Lk City UT | 15590am | | | 2100-2106 f | New Zealand, R NZ Intl | 9875pa | | |
| 2000-2100 | USA, KWHR Naalehu HI | 15405as | | | 2100-2200 | Nigeria, FRCN/Radio | 3326do | 4770do | 4990do |
| 2000-2100 | USA, Monitor Radio Intl | 9355pa | | | 2100-2157 | North Korea, R Pyongyang | 6575eu | 9345eu | 11700eu |
| 2000-2030 | USA, Voice of America | 4950af | 6035af | 7375af | 2100-2200 vl | Papua New Guinea, NBC | 4890do | | |
| | | 9760af | 9770af | 11855af | 2100-2156 | Romania, R Romania Intl | 7105eu | 7195eu | 9690eu |
| | | 15410af | 15445af | 15580af | 2100-2200 | Russia, Voice of Russia WS | 7250eu | 7350eu | 7440eu |
| | | 17755af | | | | | 9620eu | 9655eu | 9710eu |
| 2000-2100 | USA, WEWN Birmingham AL | 5825na | 13615na | 15745eu | | | 9740eu | 9765eu | 9880eu |
| 2000-2100 | USA, WGTG McCaysville GA | 9400am | | | | | 11840eu | | |
| 2000-2100 | USA, WHRI Noblesville IN | 9495am | 13760eu | | 2100-2200 as | S Africa, World Music R | 3345eu | 6290af | |
| 2000-2100 | USA, WINB Red Lion PA | 13790eu | | | 2100-2130 | Serbia, R Yugoslavia | 6100eu | 6185eu | |
| 2000-2100 | USA, WJCR Upton KY | 7490na | | | 2100-2130 | Slovakia, AWR Europe | 6055eu | 11610af | |
| 2000-2100 smtwhf | USA, WMLK Bethel PA | 9465eu | | | 2100-2200 | South Korea, R Korea Intl | 6480eu | 15575eu | |
| 2000-2100 | USA, WRMI/R Miami Intl | 9955am | | | 2100-2130 | South Korea, R Korea Intl | 3970eu | | |
| 2000-2100 | USA, WRNO New Orleans LA | 7355am | | | 2100-2200 as | Spain, R Exterior Espana | 6125eu | 11775af | |
| 2000-2100 | USA, WWCR Nashville TN | 9475am | 12160am | 13845am | 2100-2105 | Syria, Radio Damascus | 12085na | 13610eu | |
| 2000-2100 | USA, WYFR Okeechobee FL | 17555eu | 17845af | 21525af | 2100-2200 | Uganda, Radio | 4976do | | |
| 2000-2010 | Vatican State, Vatican R | 4005eu | 5882eu | 7250eu | 2100-2200 | Ukraine, R Ukraine Intl | 5905eu | 6010eu | 6020eu |
| 2000-2030 | Vatican State, Vatican R | 7365af | 9660af | 11625af | | | 7170eu | 7240eu | 7380au |
| 2000-2100 | Zambia, Christian Voice | 3330af | 4965af | | | | 9560na | 9640na | 12040na |
| 2000-2100 vl | Zambia, R Zambia/ZNBC 2 | 6165do | | | | | 13720sa | | 13590na |
| 2000-2100 vl | Zimbabwe, Zimbabwe BC | 4828do | | | 2100-2200 | United Kingdom, BBC WS | 3255af | 3915as | 3955eu |
| 2005-2100 | Syria, Radio Damascus | 12085na | 13610eu | | | | 5975as | 6005af | 6180eu |
| 2015-2030 | Namibia, NBC | 3270do | 3290do | | | | 6195va | 7325va | 9410eu |
| 2025-2045 | Italy, RAI Intl | 7120na | 9710na | 11840na | | | 11750sa | 11835af | 11945as |
| 2025-2035 mtwhf | Latvia, Radio | 5935eu | | | | | 15400af | | |
| 2030-2100 | Armenia, Voice of | 7480eu | 9965eu | | 2100-2130 | United Kingdom, BBC WS | 9630af | 15485af | |
| 2030-2100 | Cuba, Radio Havana | 13715eu | 13725eu | | 2100-2145 | United Kingdom, BBC WS | 11680sa | | |
| 2030-2100 | Egypt, Radio Cairo | 15375af | | | 2100-2200 | USA, KAIJ Dallas TX | 13815am | | |
| 2030-2100 | Germany, Adventist World R | 9830eu | | | 2100-2200 | USA, KBTN Salt Lk City UT | 15590am | | |
| 2030-2100 | Iran, VOIRI | 6165pa | 6175pa | | 2100-2200 | USA, Monitor Radio Intl | 15280as | 15665eu | |
| 2030-2100 | Slovakia, AWR Europe | 11610af | | | 2100-2200 | USA, Voice of America | 6035af | 6040me | 7375af |
| 2030-2100 as | Sweden, Radio | 6065as | 13625as | | | | 9535af | 9760eu | 11870pa |
| 2030-2045 | Thailand, Radio | 9655eu | 9680eu | 11905eu | | | 11750sa | 11945as | 12095eu |
| 2030-2100 as | USA, Voice of America | 4950af | | | | | | | |
| 2030-2100 | Uzbekistan, R Tashkent | 9540eu | 9545eu | | | | | | |
| 2030-2057 | Vietnam, Voice of | 9840eu | 12020eu | 15010eu | | | | | |
| 2045-2100 | India, All India Radio | 7150eu | 7410eu | 9910au | | | | | |
| | | 11620eu | 11715pa | | | | | | |
| 2052-2100 smtwh | New Zealand, R NZ Intl | 11735pa | | | | | | | |
| 2059-2100 a | New Zealand, R NZ Intl | 11735pa | | | | | | | |
| 2100-2130 | Albania, R Tirana Intl | 7110eu | 9515eu | | | | | | |
| 2100-2200 | Anguilla, Caribbean Beacon | 11775am | | | | | | | |
| 2100-2200 | Australia, Radio | 7240pa | 9415va | 9615as | | | | | |
| | | 11695pa | 12080pa | 15365pa | | | | | |
| 2100-2130 | Australia, Radio | 6355va | 11800pa | 11880pa | | | | | |
| 2100-2130 vl | Australia, VL8A Alice Spg | 2310do | | | | | | | |
| 2100-2130 vl | Australia, VL8K Katherine | 2485do | | | | | | | |
| 2100-2200 | Australia, VL8K Katherine | 5025do | | | | | | | |
| 2100-2130 vl | Australia, VL8T Tent Crk | 2325do | | | | | | | |

THANK YOU ...

ADDITIONAL CONTRIBUTORS TO THIS MONTH'S SHORTWAVE GUIDE:

Sonny M. Ashimori, Japan; John Babbis, Silver Spring, MD; Hans van den Booger, Finland; Bob Fraser, Cohasset, MA; Mark Veldhuis, Borne, Netherlands; BBCMS/World Media; *Cumbre DX; Fine Tuning; Hard-Core-DX; The Four Winds; DX Ontario; NASWA Journal*; Usenet newsgroups.

THANK YOU ...

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2200 UTC

6:00 PM EDT/3:00 PM PDT

SHORTWAVE GUIDE

2300 UTC

7:00 PM EDT/4:00 PM PDT

FREQUENCIES

| | | | | | | | | | | | | |
|-----------|----------------------------|--------------------|--------------------|---------|---------|---------|---|---|--|--|--------------------------------------|-------------------|
| 2100-2200 | USA, WEWN Birmingham AL | 15185as 17725af | 15410af 17735as | 15445af | 15580af | 15685am | 2230-2300 2230-2300 2230-2227 2230-2300 2240-2250 2245-2300 2245-2300 2245-2300 2300-0000 2300-0000 2300-0000 | Canada, R Canada Intl Cuba, Radio Havana Czech Rep, Radio Prague Iraq, Radio Iraq Intl Greece, Voice of Ghana, Ghana Broadc Corp India, All India Radio Vatican State, Vatican R Anguilla, Caribbean Beacon Australia, Radio | 5960am 6000na 7345na 11785eu 7480au 3366do 9705as 7305as 6090am 9660pa 15365pa | 9755am 6180na 11600na 11785eu 9425au 4915do 9950as 9600as 12080pa 17750as | 13670am | |
| 2100-2200 | USA, WGTG McCaysville GA | 9400am | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | Australia, VL8K Katherine Australia, VL8T Tent Crk Bulgaria, Radio Canada, CBC N Quebec Svc Canada, CFRX Toronto Canada, CFVP Calgary Canada, CHNX Halifax Canada, CKZN St John's Canada, CKZU Vancouver Canada, R Canada Intl | 5025do 4910do 7480na 9625do 6070do 6030do 6130do 6160do 6160do 9755am | 9435na | | |
| 2100-2200 | USA, WHRI Noblesville IN | 9495am | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | Costa Rica, Adv World R | 5030am 15460am | 9725am | 13750am | |
| 2100-2200 | USA, WIBN Red Lion PA | 13790eu | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | Costa Rica, RF Peace Intl Cuba, Radio Havana Egypt, Radio Cairo Germany, Deutsche Weile Guam, AWR/KSDA Guatemala, Adv World R India, All India Radio Lebanon, Voice of Hope Liberia, LCN/R Liberia Int Malaysia, Radio | 7385am 6000na 9900na 5980as 11775as 11775am 9705as 9960va 5100do 7295do | 15050am 6180na 9690as | | |
| 2100-2200 | USA, WJCR Upton KY | 7490na | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | New Zealand, R NZ Intl Nigeria, FRCN/Radio North Korea, R Pyongyang | 11735pa 3326do 15130na | 4770do 11700na | 4990do 13650na 13760na | |
| 2100-2200 | USA, WRMI/R Miami Intl | 9955am | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | Papua New Guinea, NBC Romania, R Romania Intl | 9675do 5990na | 6155na | 9510na | 9570na |
| 2100-2200 | USA, WRNO New Orleans LA | 7355am | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | Russia, Voice of Russia WS Turkey, Voice of United Kingdom, BBC WS | 7125na 6135na 3915as 9580as | 7250na 7280eu 5965as 9590na | 9665na 9655na 5975am 9915am | 6175am 11750na |
| 2100-2200 | USA, WWCR Nashville TN | 5070am | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | United Kingdom, BBC WS USA, KALJ Dallas TX USA, KTBN Salt Lk City UT | 15400af 13815am 15590am | | | |
| 2100-2200 | USA, WYFR Okeechobee FL | 17845eu | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | USA, Monitor Radio Intl USA, Voice of America | 15280as 7215as 15185as 15290as | 9705as 9770as | 11760as 15305as | 17735as |
| 2100-2200 | Zambia, R Zambia/ZNBC 1 | 4910do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | USA, WEWN Birmingham AL USA, WGTG McCaysville GA USA, WHRI Noblesville IN USA, WIBN Red Lion PA USA, WJCR Upton KY USA, WRMI/R Miami Intl USA, WRNO New Orleans LA | 5825na 5085am 5745am 13790am 7490na 9955am 7355am | 9975na | 13615na | |
| 2100-2200 | Zambia, Christian Voice | 3330af | 4965af | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | Sierra Leone, SLBS | 3316do | | | |
| 2100-2200 | Zambia, R Zambia/ZNBC 1 | 4910do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2100-2200 | Zambia, R Zambia/ZNBC 2 | 6165do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2100-2200 | Zimbabwe, Zimbabwe BC | 4828do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2107-2200 | New Zealand, R NZ Intl | 11735pa | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2115-2200 | Egypt, Radio Cairo | 9900eu | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2115-2300 | United Kingdom, BBC WS | 6175am | 15390am | 17715am | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2120-2200 | Sweden, Radio | 6065eu | 9430af | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2130-2200 | Australia, Radio | 13755pa | 17795pa | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2130-2155 | Austria, R Austria Intl | 5945eu | 6155eu | 13730af | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2130-2200 | China, China Radio Intl | 5220eu | 6950eu | 9920eu | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2130-2157 | Czech Rep, Radio Prague | 11600af | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2130-2200 | Ghana, Ghana Broad Corp | 3366do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2130-2200 | Guam, AWR/KSDA | 15310as | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2130-2200 | Malawi, MBC | 3380do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2130-2200 | South Korea, R Korea Intl | 6480eu | 15575eu | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2130-2200 | Uzbekistan, R Tashkent | 9540as | 9545me | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2145-2200 | Greece, Voice of | 7480au | 9425au | 11730na | 17745na | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Anguilla, Caribbean Beacon | 11775am | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Australia, Radio | 9660pa | 11695pa | 12080pa | 13755pa | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Australia, VL8K Katherine | 17750pa | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Australia, VL8T Tent Crk | 5025do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CBC N Quebec Svc | 9625do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CFRX Toronto | 6070do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CFVP Calgary | 6030do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CHNX Halifax | 6130do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CKZN St John's | 6160do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CKZU Vancouver | 6160do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, R Canada Intl | 5960eu | 9755am | 11705as | 13670am | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Australia, Radio | 17750pa | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Australia, VL8K Katherine | 5025do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Australia, VL8T Tent Crk | 4910do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CFRX Toronto | 9625do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CFVP Calgary | 6030do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CHNX Halifax | 6130do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CKZN St John's | 6160do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, CKZU Vancouver | 6160do | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Canada, R Canada Intl | 5960eu | 9755am | 11705as | 13670am | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | China, China Radio Intl | 9880eu | | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2300 | Costa Rica, RF Peace Intl | 7385am | 15050am | | | | 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 2300-0000 | | | | | |
| 2200-2210 | Croatia, Croatian Radio | 5895eu | | | | | 2300-0000 2300- | | | | | |

SPOTLIGHT ON THE WRN

Note: This entire listing is the complete schedule of the World Radio Network (WRN Network 1) to North America. WRN-1 rebroadcasts these programs via the internet (www.wrn.org/

sched_us.html) in both the RealAudio and StreamWorks formats. This listing is the result of monitoring the output of WRN-1; no assistance was provided by the

World Radio Network in this creation. Readers should be aware that, for the most part, these are delayed broadcasts which have no relationship to the frequency schedules on the preceding pages.

SUNDAY

0000 Radio Australia
0000 RA News. See A 1100.
0005 Jazz Notes. See A 1105.
0030 Innovations. Desley Blanch reports on Australian inventions and innovative practices.
0100 YLE Radio Finland
0100 News/Weather. See S 1400.
0114 Feature Stories from Last Week. A review of last week's main stories.
0124 Nunti Latini. See S 1424.
0130 Radio Sweden
0130 Spectrum (1/4). See A 1930.
0200 Radio Prague - Czech Republic
0200 News. See S 1300.
0205 Live in Prague. See A 1304.
0230 Radio Austria International
0230 Report from Austria. See A 1630.
0231 Letter from Austria. See A 1631.
0244 Letterbox. See A 1635.
0246 Music. See A 1646.
0300 Polish Radio Warsaw
0300 The News from Poland. See S 0300.
0330 Radio Budapest - Hungary
0330 News. A bulletin of world and national news.
0400 RTE Radio 1 - Dublin, Ireland
0400 News. Two minutes of news from RTE Radio 1.
0402 The Irish Collection. See T 0400.
0500 Julian Isherwood - Copenhagen
0500 Copenhagen Calling. A weekly, independent broadcast produced for WRN by Julian Isherwood in Copenhagen. It is Denmark's only international, English-language broadcast giving news, current affairs, business and cultural coverage of the country.
0530 United Nations Radio - New York
0530 The World in Review. See S 1330.
0600 Polish Radio Warsaw
0600 The News from Poland. See S 0300.
0630 Radio Canada International
0630 News. News from either the Canadian Broadcasting Corporation (CBC) or Radio Canada International (RCI).
0635 Venture Canada. A new weekly magazine promoting Canadian business achievement.
0700 Radio Australia
0700 RA News. See A 1100.
0800 Voice of Russia
0800 News. See S 2000.
0900 Radio Prague - Czech Republic
0900 News. See S 1300.
0930 Radio Netherlands
0930 RN News. See S 2300.
1030 YLE Radio Finland
1030 News/Weather. See S 1400.
1100 Radio Australia
1100 RA News. See A 1100.
1110 Oz Sounds. Twenty minutes of music selections by Radio Australia announcers.

1130 Science File. Ian Wood examines the world of science, medicine and technology.
1200 RTE Radio 1 - Dublin, Ireland
1200 The News at One. See W 1200.
1238 Business News. See H 1238.
1240 Sport News. See F 1240.
1245 Liveline. See A 1245.
1300 Radio Prague - Czech Republic
1300 News. World news summary.
1305 The Week in Politics. See M 0205.
1312 From the Weeklies. Items and editorial opinion from the weekend Czech papers.
1319 Media Check. See T 1322.
1330 United Nations Radio - New York
1330 The World in Review. Recapping the news from the UN during the preceding week.
1345 Scope. A news program about the United Nations and its related agencies.
1400 YLE Radio Finland
1400 News/Weather. World and Finnish news, regional weather, a business report, and currency exchange rates.
1405 Editorial Commentary in the Finnish Press. See T 1407.
1411 Reports and Features on Life in Finland. See M 1411.
1414 Starting Finnish. Finnish language lessons for English speakers.
1424 Nunti Latini. News. The only program on shortwave in Latin.
1430 Radio Vlaanderen International - Belgium
1430 News. A world news summary.
1435 Radio World. Updates to international broadcasting schedules and what's being heard on shortwave in Belgium.
1444 PO Box 26. Listener letters are read and answered in this mailbox program.
1500 Radio France International
1500 RFI News. World news, French news, press review, sports.
1522 Asia File. Correspondent reports and interviews on Asian affairs.
1530 News Headlines. See T 1530.
1533 Club 9516. Listener letters are read in this mailbag program.
1547 Letter from a Listener. See W 1547.
1600 Julian Isherwood - Copenhagen
1600 Norden This Week. A news and current affairs program dealing with events in Denmark, Finland, Iceland, Norway and Sweden compiled and produced by Julian Isherwood and sponsored by the Nordic Council of Ministers.
1615 Independent Production - London
1615 Health Watch. A weekly program produced in London about developments in medicine.
1630 Radio Austria International
1630 Report from Austria. See A 1630.
1700 Julian Isherwood - Copenhagen
1700 Copenhagen Calling. See S 0500.
1730 RTE Radio 1 - Dublin, Ireland

1730 The Angelus. Ringing of the church bells of Dublin.
1731 The Six O'Clock News. A quarter hour of news from Ireland.
1737 Sports News. See A 1737.
1800 Radio Vlaanderen International - Belgium
1800 News. See S 1431.
1804 Radio World. See S 1435.
1813 PO Box 26. See S 1444.
1830 Radio Netherlands
1830 RN News. See S 2300.
1837 Wide Angle. The weekend edition of Newsline produced by the current affairs team.
1855 Siren Song. Dheera Sujan presents an in-depth current affairs story that will capture and hold your attention.
1925 World Radio Network
1925 WRN Program Guide. See S 2355.
1930 Radio Sweden
1930 Sounds Nordic. See S 0130.
2000 Voice of Russia
2000 News. Ten minutes of news every hour on the hour.
2011 Sunday Panorama. A magazine program.
2030 Polish Radio Warsaw
2030 The News from Poland. See S 0300.
2038 Panorama. See M 0308.
2100 RTE Radio 1 - Dublin, Ireland
2100 RTE Radio 1 News at Ten. See M 2100.
2102 Drama. A play for radio.
2125 Nocturne. Classical music and Irish folk songs.
2200 RTE Radio 1 News at Eleven. See M 2200.
2202 Sports News. See T 2202.
2215 Country Time. See A 2215.
2300 Radio Netherlands
2300 RN News. Bulletin of world news at the start of all programs.
2306 Sincerely Yours. The Sunday replacement for "Happy Station" that lets the listener comment about the RN's programming.
2325 Sounds Interesting. Robert Chesal takes listener

HAUSER'S HIGHLIGHTS

ALGERIA: R. ALGERIA INT'L

printed sched for May-Sept

| | | |
|--|---------------------------------|---------|
| 0600-2100 | 50 kW | 11715eu |
| 1000-2100 | 100 kW | 15160eu |
| French Network 3 until 1600 and 1800-1900 | | |
| English at 1600, 2000, Spanish at 1700, 1900 | | |
| 7245 kHz. 100 kW to Maghreb | | |
| Network 3 | 0600-0800, 1100-1200, 1300-1500 | |
| Network 2 | 1500-2000 | |
| Network 1 | 0800-1100, 1200-1300 (RAI) | |

NOTE: THIS IS THE OUTPUT OF WRN-1 VIA THE INTERNET (WWW.WRN.ORG/SCHED_US.HTML).

feedback and incorporates their ideas into the show.

2355 World Radio Network

2355 WRN Program Guide. A five-minute resume of upcoming programs.

MONDAY

0000 Radio Australia
0000 RA News. See A 1100.
0010 Correspondents' Report. The ABC's foreign correspondents report home with Hamish Robertson.
0030 The Australian Music Show. Kim Taylor presents the music, people, and issues of the Australian contemporary music industry.
0100 YLE Radio Finland
0100 News/Weather. See S 1400.
0109 Reports and Features on Life in Finland. See M 1411.
0125 Echo. See A 1406.
0130 Radio Sweden
0130 Sounds Nordic (2/4). The very latest and best in Swedish rock and pop music, interviews with the stars, and what's happening on the youth scene.
0200 Radio Prague - Czech Republic
0200 News. See S 1300.
0205 The Week in Politics. A wrap-up of the previous week's political affairs.
0206 Current Affairs. See M 1306.
0209 Press Review. See T 1309.
0212 From the Weeklies. See S 1320.
0230 Radio Austria International
0230 Report from Austria. See A 1630.
0235 Letterbox. See A 1635.
0244 Profile.
0300 Polish Radio Warsaw
0300 The News from Poland. See S 0300.
0308 Panorama. Examining day-to-day life in Poland.
0330 Radio Budapest - Hungary
0330 News. See S 0330.
0336 ...and the Gatepost (1/4). The biweekly feedback slot where listeners have their say on programs and on any subject.
0336 Hungary Today. The new half-hour format includes business (Tue), daily stock market briefs, cultural coverage, and everything else taking place in Hungary.
0400 RTE Radio 1 - Dublin, Ireland
0400 News. See S 0400.
0402 The Irish Collection. See T 0400.
0500 Channel Africa - South Africa
0500 News. See M 1330.
0505 Dateline Africa. See T 1335.
0530 British Broadcasting Corporation (BBC)
0530 Europe Today. All the latest news, analysis and comment.
0600 Polish Radio Warsaw
0600 The News from Poland. See S 0300.
0607 Radio Canada International
0607 The Mailbag. Listener letters, musical selections, and happenings in Canada.
0608 Polish Radio Warsaw
0608 Panorama. See M 0308.
0630 Radio Canada International
0630 News. See S 0630.
0700 Radio Australia
0700 RA News. See A 1100.
0800 Voice of Russia
0800 News. See S 2000.
0900 Radio Prague - Czech Republic
0900 News. See S 1300.

0905 The Week in Politics. See M 0205.
0909 Press Review. See T 1309.
0912 From the Weeklies. See S 1320.
0930 Radio Netherlands
0930 RN News. See S 2300.
0938 Newsline. See M 2308.
1030 YLE Radio Finland
1030 News/Weather. See S 1400.
1037 Editorial Commentary in the Finnish Press. See T 1407.
1042 Reports and Features on Life in Finland. See M 1411.
1100 Radio Australia
1100 RA News. See A 1100.
1110 Dateline. See F 1110.
1200 RTE Radio 1 - Dublin, Ireland
1200 The News at One. See W 1200.
1238 Business News. See H 1238.
1240 Sport News. See F 1240.
1245 Liveline. See A 1245.
1300 Radio Prague - Czech Republic
1300 News. See S 1300.
1305 The Week in Politics. See M 0205.
1306 Current Affairs. People and events in the Czech Republic and editorial commentary.
1309 Press Review. See T 1309.
1311 Magazine '97. See T 0211.
1330 Channel Africa - South Africa
1330 News. Five minutes of international news from the land of the wind-up radio.
1335 Dateline Africa. See T 1335.
1400 YLE Radio Finland
1400 News/Weather. See S 1400.
1407 Editorial Commentary in the Finnish Press. See T 1407.
1411 Reports and Features on Life in Finland. A magazine program.
1430 Radio Vlaanderen International - Belgium
1430 News. See S 1431.
1435 Press Review. See T 1435.
1439 Belgium Today. Current affairs in Belgium.
1446 The Arts. Cultural events in the news.
1500 Radio France International
1500 RFI News. See S 1500.
1526 Review of the French Newspapers. Highlights of articles from the French print media.
1530 News Headlines. See T 1530.
1531 RFI Europe. European press review focuses on current affairs in other countries of the region.
1544 Arts in France. Profile on the work of a French artist or a cultural activity such as music.
1549 Insight. A report on a particular topic of worldwide concern.
1600 Caribbean News Agency (CANA)
1600 Caribbean Tempo. From the island of Barbados, CANA reports on the beat of Caribbean life.
1615 Vatican City
1615 World News. See F 1615.
1630 Radio Austria International
1630 Report from Austria. See A 1630.
1700 British Broadcasting Corporation (BBC)
1700 Europe Today. See M 0530.
1730 RTE Radio 1 - Dublin, Ireland
1730 The Angelus. See S 1730.
1731 The Six O'Clock News. See S 1731.
1746 Farm News. Agricultural news for the farmers of Ireland.
1753 Weather. See H 1753.
1800 Radio Vlaanderen International - Belgium
1800 News. See S 1431.
1806 Press Review. See T 1435.
1811 Belgium Today. See M 1439.
1830 Radio Netherlands

1830 RN News. See S 2300.
1838 Newsline. See M 2308.
1854 Music 52-15. Martha Hawley hosts this program of international music.
1925 World Radio Network
1925 WRN Program Guide. See S 2355.
1930 Radio Sweden
1930 Sixty Degrees North. See W 0130.
2000 Voice of Russia
2000 News. See S 2000.
2011 News and Views. Russian views on news developments.
2030 Polish Radio Warsaw
2030 The News from Poland. See S 0300.
2050 Cookery Corner. See T 0320.
2100 RTE Radio 1 - Dublin, Ireland
2100 RTE Radio 1 News at Ten. A two-minute summary of news from around Ireland.
2102 Ireland Tonight (Part 1). The first hour of this magazine program.
2200 RTE Radio 1 News at Eleven. A two-minute news update.
2202 Sports News. See T 2202.
2214 Ireland Tonight (Part 2). See W 2214.
2255 Weather. See H 1753.
2300 Radio Netherlands
2300 RN News. See S 2300.
2308 Newsline. Correspondent reports, interviews, and commentaries on current events.
2325 Research File. A program of science and technology.
2355 World Radio Network
2355 WRN Program Guide. See S 2355.

TUESDAY

0000 Radio Australia
0000 RA News. See A 1100.
0010 Pacific Focus. See A 0010.
0030 Australia Today. See W 0030.
0100 YLE Radio Finland
0100 News/Weather. See S 1400.
0107 Editorial Commentary in the Finnish Press. See T 1407.
0112 Reports and Features on Life in Finland. See M 1411.
0130 Radio Sweden
0130 Sixty Degrees North. See W 0130.
0131 News. The news segment of Sixty Degrees North.

HAUSER'S HIGHLIGHTS

KOREA NORTH: R. PYONGYANG

reorganized its schedule, added German, and expanded all broadcasts from 50 to 57 minutes; English monitored at times previously believed to Ams:
2300 on 11335, 11700, 13760, 15130;
0000 on 11845, 13650, 15230;
1100 on 3560, 9640, 9975, 11335, 13650, 15230
(Sonny Ashimori, Japan, *hard-core dx*)
15230 and 15130 produce mixing products on 15330 and 15030, such as in Korean at 2212 (Hans van den Boogert, Taiwan, DSWCI DX Window)

NOTE: THIS IS THE OUTPUT OF WRN-1 VIA THE INTERNET (WWW.WRN.ORG/SCHED_US.HTML).

0146 SportScan. See S 0130.
 0200 Radio Prague - Czech Republic
 0200 News. See S 1300.
 0206 Current Affairs. See M 1306.
 0209 Press Review. See T 1309.
 0211 Magazine '97. Music and interviews about current Czech affairs.
 0230 Radio Austria International
 0230 Report from Austria. See A 1630.
 0300 Polish Radio Warsaw
 0300 The News from Poland. See S 0300.
 0320 Cookery Corner. Try a recipe from Poland.
 0330 Radio Budapest - Hungary
 0330 News. See S 0330.
 0336 Hungary Today. See M 0336.
 0400 RTE Radio 1 - Dublin, Ireland
 0400 News. See S 0400.
 0402 The Irish Collection. RTE Radio 1's late night service with selected highlights from the previous day's RTE schedule, news and sport, music, documentaries, and drama.
 0500 Channel Africa - South Africa
 0500 News. See M 1330.
 0505 Dateline Africa. See T 1335.
 0530 British Broadcasting Corporation (BBC)
 0530 Europe Today. See M 0530.
 0600 Polish Radio Warsaw
 0600 The News from Poland. See S 0300.
 0620 Cookery Corner. See T 0320.
 0630 Radio Canada International
 0630 News. See S 0630.
 0641 Spectrum. A weekday magazine program of current affairs, features, and a business report.
 0700 Radio Australia
 0700 RA News. See A 1100.
 0800 Voice of Russia
 0800 News. See S 2000.
 0900 Radio Prague - Czech Republic
 0900 News. See S 1300.
 0909 Press Review. See T 1309.
 0911 Magazine '97. See T 0211.
 0930 Radio Netherlands
 0930 RN News. See S 2300.
 0938 Newsline. See M 2308.
 1030 YLE Radio Finland
 1030 News/Weather. See S 1400.
 1037 Editorial Commentary in the Finnish Press. See T 1407.
 1042 Reports and Features on Life in Finland. See M 1411.
 1100 Radio Australia
 1100 RA News. See A 1100.
 1110 Dateline. See F 1110.
 1130 The Health Report. A program that examines health issues and makes complex scientific data understandable.
 1200 RTE Radio 1 - Dublin, Ireland
 1200 The News at One. See W 1200.
 1238 Business News. See H 1238.
 1240 Sport News. See F 1240.
 1245 Liveline. See A 1245.
 1300 Radio Prague - Czech Republic
 1300 News. See S 1300.
 1306 Current Affairs. See M 1306.
 1309 Press Review. News items and editorial comment from the Czech newspapers.
 1311 Talking Point. Discussion of a topic of concern to the Czech people.
 1319 Media Check. News items and editorial comment from foreign press, television, and radio.
 1330 Channel Africa - South Africa
 1330 News. See M 1330.

1335 Dateline Africa. A news magazine lightly sprinkled with African music.
 1400 YLE Radio Finland
 1400 News/Weather. See S 1400.
 1407 Editorial Commentary in the Finnish Press. Editorial opinion and reports on Finnish and world events.
 1411 Reports and Features on Life in Finland. See M 1411.
 1430 Radio Vlaanderen International - Belgium
 1430 News. See S 1431.
 1435 Press Review. Stories on the front pages of the day's papers.
 1439 Belgium Today. See M 1439.
 1445 Focus on Europe. A report on happenings in the European Economic Community (ECC).
 1450 Sports Report. A roundup of the results of seasonal sports activities.
 1500 Radio France International
 1500 RFI News. See S 1500.
 1526 Review of the French Newspapers. See M 1526.
 1530 News Headlines. A summary of today's news.
 1532 Books. New books, publishing trends, and authors.
 1537 Discovery. A weekly feature about the world of science.
 1542 News Summary. An update of today's news and sports.
 1546 Land of France. A feature on life and times in France.
 1551 Echoes from Africa. Report on exports from an African country.
 1600 Caribbean News Agency (CANA)
 1600 Caribbean Tempo. See M 1600.
 1615 Vatican City
 1615 World News. See F 1615.
 1630 Radio Austria International
 1630 Report from Austria. See A 1630.
 1700 British Broadcasting Corporation (BBC)
 1700 Europe Today. See M 0530.
 1730 RTE Radio 1 - Dublin, Ireland
 1730 The Angelus. See S 1730.
 1731 The Six O'Clock News. See S 1731.
 1746 Farm News. See T 1746.
 1753 Weather. See H 1753.
 1800 Radio Vlaanderen International - Belgium
 1800 News. See S 1431.
 1806 Press Review. See T 1435.
 1811 Belgium Today. See M 1439.
 1816 Living in Belgium. Belgian lifestyles and activities.
 1819 Green Society. Environmental issues facing Belgium.
 1830 Radio Netherlands
 1830 RN News. See S 2300.
 1838 Newsline. See M 2308.
 1854 Sounds Interesting. Robert Chesal takes listener feedback and incorporates their ideas into the show.
 1925 World Radio Network
 1925 WRN Program Guide. See S 2355.
 1930 Radio Sweden
 1930 Sixty Degrees North. See W 0130.
 1946 MediaScan (1/3). Satellite news 85%; medium wave and shortwave news 15%.
 2000 Voice of Russia
 2000 News. See S 2000.
 2011 News and Views. See M 2011.
 2030 Polish Radio Warsaw
 2030 The News from Poland. See S 0300.
 2050 Letter from Poland. See W 0320.
 2100 RTE Radio 1 - Dublin, Ireland
 2100 RTE Radio 1 News at Ten. See M 2100.
 2102 Ireland Tonight (Part 1). See M 2102.
 2200 RTE Radio 1 News at Eleven. See M 2200.

2202 Sports News. A 12-minute report on seasonal sports.
 2214 Ireland Tonight (Part 2). See W 2214.
 2255 Weather. See H 1753.
 2300 Radio Netherlands
 2300 RN News. See S 2300.
 2308 Newsline. See M 2308.
 2325 Mirror Images. Weekly magazine of music, the arts, culture, and European festivals, produced and presented by David Swatling.
 2355 World Radio Network
 2355 WRN Program Guide. See S 2355.

WEDNESDAY

0000 Radio Australia
 0000 RA News. See A 1100.
 0030 Australia Today. Colin Tyrus presents the issues, the places, and the characters that make up Australia.
 0100 YLE Radio Finland
 0100 News/Weather. See S 1400.
 0107 Editorial Commentary in the Finnish Press. See T 1407.
 0112 Reports and Features on Life in Finland. See M 1411.
 0130 Radio Sweden
 0130 Sixty Degrees North. Reports, interviews and analysis from Stockholm and other Nordic capitals.
 0131 News. See T 0131.
 0146 Money Matters. Al Simon presents news about the Swedish economy, business, consumer affairs, and Sweden's EU membership.
 0200 Radio Prague - Czech Republic
 0200 News. See S 1300.
 0206 Current Affairs. See M 1306.
 0209 Press Review. See T 1309.
 0211 Talking Point. See T 1311.
 0219 Media Check. See T 1322.
 0230 Radio Austria International
 0230 Report from Austria. See A 1630.
 0300 Polish Radio Warsaw
 0300 The News from Poland. See S 0300.
 0320 Letter from Poland. A personal look at Poland today.
 0330 Radio Budapest - Hungary
 0330 News. See S 0330.
 0336 Hungary Today. See M 0336.
 0400 RTE Radio 1 - Dublin, Ireland
 0400 News. See S 0400.
 0402 The Irish Collection. See T 0400.
 0500 Channel Africa - South Africa
 0500 News. See M 1330.
 0505 Dateline Africa. See T 1335.
 0530 British Broadcasting Corporation (BBC)
 0530 Europe Today. See M 0530.
 0600 Polish Radio Warsaw
 0600 The News from Poland. See S 0300.
 0620 Letter from Poland. See W 0320.
 0630 Radio Canada International

HAUSER'S HIGHLIGHTS
HAWAII: KWHR

DXing with Cumbre
 Sat 0230 on 17510,
 Sat 1130 & Sun 1630
 on 9930, Sun 1830 on 13625
 (*Cumbre DX*)

NOTE: THIS IS THE OUTPUT OF WRN-1 VIA THE INTERNET (WWW.WRN.ORG/SCHED_US.HTML).

0630 News. See S 0630.
 0641 Spectrum. See T 0641.
 0700 Radio Australia
 0700 RA News. See A 1100.
 0800 Voice of Russia
 0800 News. See S 2000.
 0900 Radio Prague - Czech Republic
 0900 News. See S 1300.
 0909 Press Review. See T 1309.
 0911 Talking Point. See T 1311.
 0919 Media Check. See T 1322.
 0930 Radio Netherlands
 0930 RN News. See S 2300.
 0938 Newsline. See M 2308.
 0955 Variable Documentary. See W 2325.
 1030 YLE Radio Finland
 1030 News/Weather. See S 1400.
 1037 Editorial Commentary in the Finnish Press. See T 1407.
 1042 Reports and Features on Life in Finland. See M 1411.
 1100 Radio Australia
 1100 RA News. See A 1100.
 1110 Dateline. See F 1110.
 1130 The Law Report. Susanna Lobež brings an insider's perspective to the complexities of the law.
 1200 RTE Radio 1 - Dublin, Ireland
 1200 The News at One. An hour of news about Ireland, business news, sports, and a live telephone interview.
 1238 Business News. See H 1238.
 1240 Sport News. See F 1240.
 1245 Liveline. See A 1245.
 1300 Radio Prague - Czech Republic
 1300 News. See S 1300.
 1306 Current Affairs. See M 1306.
 1309 Press Review. See T 1309.
 1312 From the Archives. An historical look at the Czech people and their lifestyle.
 1319 The Arts. Focus on a particular topic concerning Czech art.
 1330 Channel Africa - South Africa
 1330 News. See M 1330.
 1335 Dateline Africa. See T 1335.
 1400 YLE Radio Finland
 1400 News/Weather. See S 1400.
 1407 Editorial Commentary in the Finnish Press. See T 1407.
 1411 Reports and Features on Life in Finland. See M 1411.
 1430 Radio Vlaanderen International - Belgium
 1430 News. See S 1431.
 1435 Press Review. See T 1435.
 1439 Belgium Today. See M 1439.
 1500 Radio France International
 1500 RFI News. See S 1500.
 1526 Review of the French Newspapers. See M 1526.
 1530 News Headlines. See T 1530.
 1539 RFI Europe. See M 1531.
 1547 Letter from a Listener. David Page reads letters to RFI from worldwide listeners.
 1600 Caribbean News Agency (CANA)
 1600 Caribbean Tempo. See M 1600.
 1615 Vatican City
 1615 World News. See F 1615.
 1630 Radio Austria International
 1630 Report from Austria. See A 1630.
 1700 British Broadcasting Corporation (BBC)
 1700 Europe Today. See M 0530.
 1730 RTE Radio 1 - Dublin, Ireland
 1730 The Angelus. See S 1730.
 1731 The Six O'Clock News. See S 1731.
 1746 Farm News. See T 1746.

1753 Weather. See H 1753.
 1800 Radio Vlaanderen International - Belgium
 1800 News. See S 1431.
 1806 Press Review. See T 1435.
 1811 Belgium Today. See M 1439.
 1817 Around Town. See H 1444.
 1820 The Arts. See M 1446.
 1830 Radio Netherlands
 1830 RN News. See S 2300.
 1838 Newsline. See M 2308.
 1925 World Radio Network
 1925 WRN Program Guide. See S 2355.
 1930 Radio Sweden
 1930 Sixty Degrees North. See W 0130.
 2000 Voice of Russia
 2000 News. See S 2000.
 2011 News and Views. See M 2011.
 2030 Polish Radio Warsaw
 2030 The News from Poland. See S 0300.
 2050 Flashback. See H 0320.
 2100 RTE Radio 1 - Dublin, Ireland
 2100 RTE Radio 1 News at Ten. See M 2100.
 2102 Ireland Tonight (Part 1). See M 2102.
 2200 RTE Radio 1 News at Eleven. See M 2200.
 2202 Sports News. See T 2202.
 2214 Ireland Tonight (Part 2). The second hour of this magazine program.
 2255 Weather. See H 1753.
 2300 Radio Netherlands
 2300 RN News. See S 2300.
 2308 Newsline. See M 2308.
 2325 Variable Documentary. An in-depth treatment of one subject or a short series.
 2355 World Radio Network
 2355 WRN Program Guide. See S 2355.

0000 Radio Australia
 0000 RA News. See A 1100.
 0100 YLE Radio Finland
 0100 News/Weather. See S 1400.
 0107 Editorial Commentary in the Finnish Press. See T 1407.
 0112 Reports and Features on Life in Finland. See M 1411.
 0130 Radio Sweden
 0130 Sixty Degrees North. See W 0130.
 0131 News. See T 0131.
 0200 Radio Prague - Czech Republic
 0200 News. See S 1300.
 0206 Current Affairs. See M 1306.
 0209 Press Review. See T 1309.
 0214 From the Archives. See W 1312.
 0219 The Arts. See W 1319.
 0230 Radio Austria International
 0230 Report from Austria. See A 1630.
 0300 Polish Radio Warsaw
 0300 The News from Poland. See S 0300.
 0320 Flashback. Polish history remembered.
 0330 Radio Budapest - Hungary
 0330 News. See S 0330.
 0336 Hungary Today. See M 0336.
 0400 RTE Radio 1 - Dublin, Ireland
 0400 News. See S 0400.
 0402 The Irish Collection. See T 0400.
 0500 Channel Africa - South Africa
 0500 News. See M 1330.
 0505 Dateline Africa. See T 1335.
 0530 British Broadcasting Corporation (BBC)
 0530 Europe Today. See M 0530.
 0600 Polish Radio Warsaw

0600 The News from Poland. See S 0300.
 0620 Flashback. See H 0320.
 0630 Radio Canada International
 0630 News. See S 0630.
 0641 Spectrum. See T 0641.
 0700 Radio Australia
 0700 RA News. See A 1100.
 0800 Voice of Russia
 0800 News. See S 2000.
 0900 Radio Prague - Czech Republic
 0900 News. See S 1300.
 0909 Press Review. See T 1309.
 0912 From the Archives. See W 1312.
 0918 The Arts. See W 1319.
 0930 Radio Netherlands
 0930 RN News. See S 2300.
 0938 Newsline. See M 2308.
 0954 Media Network. See H 2325.
1030 YLE Radio Finland
 1030 News/Weather. See S 1400.
 1037 Editorial Commentary in the Finnish Press. See T 1407.
 1042 Reports and Features on Life in Finland. See M 1411.
 1100 Radio Australia
 1100 RA News. See A 1100.
 1110 Dateline. See F 1110.
 1130 The Religion Report. Hosted by John Cleary.
 1200 RTE Radio 1 - Dublin, Ireland
 1200 The News at One. See W 1200.
 1238 Business News. Two minutes of commercial news and stock market report.
 1240 Sport News. See F 1240.
 1245 Liveline. See A 1245.
 1300 Radio Prague - Czech Republic
 1300 News. See S 1300.
 1306 Current Affairs. See M 1306.
 1309 Press Review. See T 1309.
 1314 Economic Report. Czech financial news.
 1319 I'd Like You to Meet. A studio interview with an interesting Czech personality.
 1330 Channel Africa - South Africa
 1330 News. See M 1330.
 1335 Dateline Africa. See T 1335.
 1400 YLE Radio Finland
 1400 News/Weather. See S 1400.
 1407 Editorial Commentary in the Finnish Press. See T 1407.
 1411 Reports and Features on Life in Finland. See M 1411.
 1430 Radio Vlaanderen International - Belgium
 1430 News. See S 1431.
 1435 Press Review. See T 1435.
 1439 Belgium Today. See M 1439.
 1444 Around Town. Current happenings in Brussels and other centers of culture.
 1448 The Arts. See M 1446.

THURSDAY

Macintosh Software

SHORTWAVE NAVIGATOR
FREQUENCY VALET • UTCLOCK

FREQUENCIES/PROGRAMS/COMPUTER CONTROL
 (DRAKE • KENWOOD • JRC)

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NOTE: THIS IS THE OUTPUT OF WRN-1 VIA THE INTERNET (WWW.WRN.ORG/SCHED_US.HTML).

1500 Radio France International
 1500 RFI News. See S 1500.
 1526 Review of the French Newspapers. See M 1526.
 1530 News Headlines. See T 1530.
 1531 Sports. A summary of the seasonal matches from around the continent.
 1533 The Bottom Line. Focus on financial matters.
 1539 Planet Earth (biweekly). An interview with an expert on ecological matters.
 1544 News Summary. See T 1542.
 1547 Letter from a Listener. See W 1547.
 1550 North/South (biweekly). Focus on a public activity in France.
 1551 Paris Promenade. Spotlight on a city bistro or restaurant.
 1600 Caribbean News Agency (CANA)
 1600 Caribbean Tempo. See M 1600.
 1615 Vatican City
 1615 World News. See F 1615.
 1630 Radio Austria International
 1630 Report from Austria. See A 1630.
 1700 British Broadcasting Corporation (BBC)
 1700 Europe Today. See M 0530.
 1730 RTE Radio 1 - Dublin, Ireland
 1730 The Angelus. See S 1730.
 1731 The Six O'Clock News. See S 1731.
 1746 Farm News. See T 1746.
 1753 Weather. The regional weather report and forecast.
 1800 Radio Vlaanderen International - Belgium
 1800 News. See S 1431.
 1806 Press Review. See T 1435.
 1811 Belgium Today. See M 1439.
 1814 International Report. See F 1445.
 1819 Economics. See F 1449.
 1830 Radio Netherlands
 1830 RN News. See S 2300.
 1838 Newsline. See M 2308.
 1925 World Radio Network
 1925 WRN Program Guide. See S 2355.
 1930 Radio Sweden
 1930 Sixty Degrees North. See W 0130.
 2000 Voice of Russia
 2000 News. See S 2000.
 2011 News and Views. See M 2011.
 2030 Polish Radio Warsaw
 2030 The News from Poland. See S 0300.
 2050 A Day in the Life Of. See F 0320.
 2100 RTE Radio 1 - Dublin, Ireland
 2100 RTE Radio 1 News at Ten. See M 2100.
 2102 Ireland Tonight (Part 1). See M 2102.
 2200 RTE Radio 1 News at Eleven. See M 2200.
 2202 Sports News. See T 2202.
 2214 Ireland Tonight (Part 2). See W 2214.
 2255 Weather. See H 1753.
 2300 Radio Netherlands
 2300 RN News. See S 2300.
 2308 Newsline. See M 2308.
 2325 Media Network. Jonathan Marks and Diana Janssen look at the world of broadcasting. Top-rated.
 2355 World Radio Network
 2355 WRN Program Guide. See S 2355.

FRIDAY

0000 Radio Australia
 0000 RA News. See A 1100.
 0010 Hindsight. Michelle Rayner presents current events from an historical perspective.
 0100 YLE Radio Finland
 0100 News/Weather. See S 1400.

0107 Editorial Commentary in the Finnish Press. See T 1407.
 0112 Reports and Features on Life in Finland. See M 1411.
 0130 Radio Sweden
 0130 Sixty Degrees North. See W 0130.
 0131 News. See T 0131.
 0146 GreenScan (2). Environmental concerns and solutions.
 0146 HeartBeat (3). A new monthly health and medical magazine.
 0146 Horizon (4/5). Science and technology in Sweden.
 0200 Radio Prague - Czech Republic
 0200 News. See S 1300.
 0206 Current Affairs. See M 1306.
 0209 Press Review. See T 1309.
 0214 Economic Report. See H 1314.
 0219 I'd Like You to Meet. See H 1319.
 0230 Radio Austria International
 0230 Report from Austria. See A 1630.
 0300 Polish Radio Warsaw
 0300 The News from Poland. See S 0300.
 0320 A day in the Life Of. Anyone from government minister to pop star to bag lady.
 0330 Radio Budapest - Hungary
 0330 News. See S 0330.
 0336 Hungary Today. See M 0336.
 0400 RTE Radio 1 - Dublin, Ireland
 0400 News. See S 0400.
 0402 The Irish Collection. See T 0400.
 0500 Channel Africa - South Africa
 0500 News. See M 1330.
 0505 Dateline Africa. See T 1335.
 0530 British Broadcasting Corporation (BBC)
 0530 Europe Today. See M 0530.
 0600 Polish Radio Warsaw
 0600 The News from Poland. See S 0300.
 0620 A Day in the Life Of. See F 0320.
 0630 Radio Canada International
 0630 News. See S 0630.
 0641 Spectrum. See T 0641.
 0700 Radio Australia
 0700 RA News. See A 1100.
 0800 Voice of Russia
 0800 News. See S 2000.
 0900 Radio Prague - Czech Republic
 0900 News. See S 1300.

0909 Press Review. See T 1309.
 0914 Economic Report. See H 1314.
 0918 I'd Like You to Meet. See H 1319.
0930 Radio Netherlands
 0930 RN News. See S 2300.
 0938 Newsline. See M 2308.
 0955 A Good Life. See F 2325.
 1030 YLE Radio Finland
 1030 News/Weather. See S 1400.
 1037 Editorial Commentary in the Finnish Press. See T 1407.
 1042 Reports and Features on Life in Finland. See M 1411.
 1100 Radio Australia
 1100 RA News. See A 1100.
 1110 Dateline. Twenty minutes of overseas and local correspondent reports and analyses of regional and global issues and events, including business news.
 1130 The Media Report. Agnes Warren presents the inside story on how the communications industry operates and puts the spotlight on media people and their activities.
 1200 RTE Radio 1 - Dublin, Ireland
 1200 The News at One. See W 1200.
 1238 Business News. See H 1238.
 1240 Sport News. A five-minute roundup of Irish sports.
 1245 Liveline. See A 1245.
 1300 Radio Prague - Czech Republic
 1300 News. See S 1300.
 1306 Current Affairs. See M 1306.
 1309 Press Review. See T 1309.
 1310 Between You and Us. Information about the Czech Republic, commentary on listener letters, and occasional DX news.
 1330 Channel Africa - South Africa
 1330 News. See M 1330.
 1335 Dateline Africa. See T 1335.
 1400 YLE Radio Finland
 1400 News/Weather. See S 1400.
 1407 Editorial Commentary in the Finnish Press. See T 1407.
 1411 Reports and Features on Life in Finland. See M 1411.
 1430 Radio Vlaanderen International - Belgium
 1430 News. See S 1431.
 1435 Press Review. See T 1435.

HAUSER'S HIGHLIGHTS
KUWAIT: RADIO STATE OF KUWAIT

Main Program In Arabic

| UTC | kHz | | | | | |
|-----------|-------|-------|-------|-------|-------|--------|
| 0000-0200 | 11675 | | | | | |
| 0200-0400 | 15505 | 15495 | 11675 | 6055 | | |
| 0400-0445 | 17885 | 15505 | 15495 | 11675 | 6055 | |
| 0445-0530 | 17885 | 15505 | 15495 | 15110 | 11675 | 6055 |
| 0530-0930 | 17885 | 15505 | 15495 | 15110 | 6055 | |
| 0930-1305 | 17885 | 15505 | 15495 | 13620 | 6055 | |
| 1305-1505 | 17885 | 15505 | 15110 | 13620 | 9880 | |
| 1505-1605 | 15505 | 15110 | 13620 | 9880 | | |
| 1605-1615 | 15505 | 15110 | 9880 | | | |
| 1615-1730 | 15505 | 15110 | 11990 | 9880 | | |
| 1730-1800 | 15505 | 11990 | 9880 | | | |
| 1800-2130 | 15505 | 15495 | 9880 | 9855 | | |
| 2130-2300 | 15505 | 15495 | 9855 | | | |
| 2300-2400 | 15495 | 9855 | | | | |
| | | | | | | (BBCM) |

Qur'an can be heard very well around 0230 on 11675 (gh)

NOTE: THIS IS THE OUTPUT OF WRN-1 VIA THE INTERNET (WWW.WRN.ORG/SCHED_US.HTML).

1439 Belgium Today. See M 1439.

1445 International Report. A background report on current affairs in Europe and elsewhere.

1449 Economics. Interview with a person in the field of business, finance, or consumerism or a updating report.

1500 Radio France International

1500 RFI News. See S 1500.

1515 Land of France. See T 1546.

1526 Review of the French Newspapers. See M 1526.

1530 News Headlines. See T 1530.

1531 Weekend. Colleagues from BBC World Service, Radio Netherlands and Deutsche Welle are joined for a weekly look at issues and themes important throughout Europe.

1600 Caribbean News Agency (CANA)

1600 Caribbean Tempo. See M 1600.

1615 Vatican City

1615 World News. A 15-minute bulletin of international news.

1630 Radio Austria International

1630 Report from Austria. See A 1630.

1700 British Broadcasting Corporation (BBC)

1700 Europe Today. See M 0530.

1730 RTE Radio 1 - Dublin, Ireland

1730 The Angelus. See S 1730.

1731 The Six O'Clock News. See S 1731.

1746 Farm News. See T 1746.

1753 Weather. See H 1753.

1800 Radio Vlaanderen International - Belgium

1800 News. See S 1431.

1806 Press Review. See T 1435.

1810 Belgium Today. See M 1439.

1814 The Arts. See M 1446.

1819 Tourism. Take an audio tour of the sights and sounds of Belgium.

1830 Radio Netherlands

1830 RN News. See S 2300.

1838 Newsline. See M 2308.

1854 Variable Documentary. See W 2325.

1925 World Radio Network

1925 WRN Program Guide. See S 2355.

1930 Radio Sweden

1930 Sixty Degrees North. See W 0130.

1931 News. See T 0131.

1935 Newsweek. See A 0135.

2000 Voice of Russia

2000 News. See S 2000.

2011 News and Views. See M 2011.

2030 Polish Radio Warsaw

2030 The News from Poland. See S 0300.

2050 Business Week. See A 0320.

2100 RTE Radio 1 - Dublin, Ireland

2100 RTE Radio 1 News at Ten. See M 2100.

2102 Ireland Tonight (Part 1). See M 2102.

2200 RTE Radio 1 News at Eleven. See M 2200.

2202 Sports News. See T 2202.

2214 Ireland Tonight (Part 2). See W 2214.

2255 Weather. See H 1753.

2300 Radio Netherlands

2300 RN News. See S 2300.

2308 Newsline. See M 2308.

2325 A Good Life. Ginger da Silva hosts a program about development in both rich and poor countries.

2355 World Radio Network

2355 WRN Program Guide. See S 2355.

0000 Radio Australia

0000 RA News. See A 1100.

0010 Pacific Focus. Coverage of issues of relevance to people of the Pacific region.

0030 Australia Today. See W 0030.

0100 YLE Radio Finland

0100 News/Weather. See S 1400.

0107 Editorial Commentary in the Finnish Press. See T 1407.

0110 YLE Focus. See A 1411.

0130 Radio Sweden

0130 Sixty Degrees North. See W 0130.

0131 News. See T 0131.

0135 Newsweek. The major stories of the week, both from Sweden and their Nordic neighbors.

0200 Radio Prague - Czech Republic

0200 News. See S 1300.

0210 Between You and Us. See F 1310.

0230 Radio Austria International

0230 Report from Austria. See A 1630.

0300 Polish Radio Warsaw

0300 The News from Poland. See S 0300.

0320 Business Week. What's happening in Europe's newest capitalist economy.

0330 Radio Budapest - Hungary

0330 News. See S 0330.

0400 RTE Radio 1 - Dublin, Ireland

0400 News. See S 0400.

0402 The Irish Collection. See T 0400.

0500 Channel Africa - South Africa

0500 News. See M 1330.

0530 Glenn Hauser - USA

0530 World of Radio. Glenn's communications program for shortwave radio listeners.

0600 Polish Radio Warsaw

0600 The News from Poland. See S 0300.

0620 Business Week. See A 0320.

0630 Radio Canada International

0630 News. See S 0630.

0641 Spectrum. See T 0641.

0700 Radio Australia

0700 RA News. See A 1100.

0800 Voice of Russia

0800 News. See S 2000.

0900 Radio Prague - Czech Republic

0900 News. See S 1300.

0910 Between You and Us. See F 1310.

0930 Radio Netherlands

0930 RN News. See S 2300.

0938 Newsline. See M 2308.

1030 YLE Radio Finland

1030 News/Weather. See S 1400.

1100 Radio Australia

1100 RA News. Five or ten minutes of world, Australian, and regional news.

1105 Jazz Notes. The best of Australian jazz is introduced by Ivan Lloyd.

1130 Indian Pacific. News and analysis from across the Pacific and Asia with Di Martin.

1200 RTE Radio 1 - Dublin, Ireland

1200 The News at One. See W 1200.

1238 Business News. See H 1238.

1240 Sport News. See F 1240.

1245 Liveline. The last quarter-hour of the News at One in which a telephone interview is conducted with a person in the news.

1300 Radio Prague - Czech Republic

1300 News. See S 1300.

1304 Live in Prague. Jazz from one of Prague's night spots.

1330 Channel Africa - South Africa

1330 News. See M 1330.

1335 Dateline Africa. See T 1335.

1400 YLE Radio Finland

1400 News/Weather. See S 1400.

1406 Echo. YLE's mailbag program.

1411 YLE Focus. Spotlight on the achievements of a Finn of note.

1430 Radio Vlaanderen International - Belgium

1430 News. See S 1431.

1435 Press Review. See T 1435.

1439 Music from Flanders. The weekly concert.

1500 Radio France International

1500 RFI News. See S 1500.

1526 Review of the French Newspapers. See M 1526.

1530 News Headlines. See T 1530.

1531 Spotlight on Africa. Correspondent reports and interviews on African affairs with Julia Crawford.

1545 Letter from a Listener. See W 1547.

1547 News Summary. See T 1542.

1550 French Lesson. Learn French by radio.

1600 Glenn Hauser - USA

1600 World of Radio. See A 0530.

1630 Radio Austria International

1630 Report from Austria. A magazine program covering all aspects of Austrian life and events in the news and opening with the latest news bulletin.

1631 Letter from Austria. Reading of a "letter" that covers the latest goings-on in Vienna.

1635 Letterbox. Listeners' letters are read and answered on-the-air.

1646 Music. The native music of Austria.

1700 United Nations Radio - New York

1700 The World in Review. See S 1330.

1715 Scope. See S 1345.

1730 RTE Radio 1 - Dublin, Ireland

1730 The Angelus. See S 1730.

1731 The Six O'Clock News. See S 1731.

1737 Sports News. All the scores from all the games played today as well as racing results.

1800 Radio Vlaanderen International - Belgium

1800 News. See S 1431.

1805 Press Review. See T 1435.

1809 Music from Flanders. See A 1439.

1830 Radio Netherlands

1830 RN News. See S 2300.

1838 Newsline. See M 2308.

1854 Roughly Speaking. An upbeat magazine program for European youth.

1925 World Radio Network

1925 WRN Program Guide. See S 2355.

1930 Radio Sweden

1930 Spectrum (1/4). Bill Schiller with the latest on Swedish music, drama, art, and film.

1930 Sweden Today (3). George Wood presents voices from a wide range of people in the Scandinavian nation.

2000 Voice of Russia

2000 News. See S 2000.

2011 News and Views. See M 2011.

2030 Polish Radio Warsaw

2030 The News from Poland. See S 0300.

2100 RTE Radio 1 - Dublin, Ireland

2100 RTE Radio 1 News at Ten. See M 2100.

2102 Failete Isteach. Live music show.

2200 RTE Radio 1 News at Eleven. See M 2200.

2202 Sports News. See T 2202.

2215 Countrytime. Forty-five minutes of country music with an Irish accent.

2300 Radio Netherlands

2300 RN News. See S 2300.

2308 Newsline. See M 2308.

2325 Weekend. Maggie Ayre joins colleagues from BBC World Service, Radio France International and Deutsche Welle for a weekly look at issues and themes important throughout Europe.

2355 World Radio Network

2355 WRN Program Guide. See S 2355.

SATURDAY

0000 Radio Australia

0000 RA News. See A 1100.

0010 Pacific Focus. Coverage of issues of relevance to

News Service Accused of Illegal Interceptions

By Rachel Baughn, Editor

Communications privacy made the news again on August 27, when New York U.S. Attorney Mary Jo White announced the arrest of three persons connected to the Breaking News Network (BNN) for illegal interception of alpha-numeric paging messages. Steven Gessman, Vinnie Martin, and Jeffrey Moss were charged with mail fraud, conspiracy, and violating the Electronic Communications Privacy Act.

BNN is a company which supplies news tips to news organizations, fire fighters, police, insurance adjusters, and others, for a small fee.

The New York Police Department has been using alpha-numeric pagers to communicate information too sensitive to be transmitted over the radio—information such as location of crime witnesses, condition of injured law enforcement officers or firefighters, and deployment of special units such as the bomb squad. The indictments claim that BNN has been intercepting these communications and selling the information to its clients.

BNN claims to be the first to have reported the crash of TWA Flight 800, and its clients do sometimes beat city officials to the scene of breaking news events. However, BNN's public statement says it gets all of its information from 24-hour monitoring of public police radio channels. BNN says one of their pagers was the only item out of the electronic equipment presented to the press that was theirs.

Earlier in the investigation, Moss allegedly showed investigators how he used a scanner connected to his computer loaded with the "Message Tracker" software program to extract messages from PageNet—the company providing service to the police. By sifting through that information, he could eventually "clone" pagers with the identifiers for a specific recipient.

The defendants, who were all released on bail, face up to five years in prison and a \$250,000 fine if convicted. No charges will be brought against their clients, who presumably were unaware of the alleged source of the information.

BNN maintains that no sensitive information was ever transmitted by BNN to their clients, and that the anonymous charges were likely brought by two disgruntled former volunteers.

Wider Implications

Although no determination appears to have been made that the product itself is illegal, dealers of the Message Tracker have been subpoenaed to turn over information and inventory relating to the software and accessories, pending the outcome of the case.

Manufacturers of equipment capable of decoding communications modes used in paging

networks may decide to terminate shipment until a clearer interpretation of federal law is established.

Regardless of the outcome of this case, it will no doubt bolster the push for stricter laws such as that featured in our cover story, even though the arrests were made under already-existing prohibitions.

Attorney Mary Jo White was correct in her

statement that you should "protect yourself and your privacy by avoiding the use of pagers and cellular phones for sensitive information." Either that, or encrypt—an option made available by both services. However, few people choose to heed the fact that radio waves are in the air, and no wireless communications are secure unless you take steps to ensure it.

MT thanks everyone who provided news clippings on this late-breaking story.

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A world of adventure with the Grundig Yacht Boy 400 shortwave radio. Hear news (in English) direct from the world's capitals... as it happens. The compact, easy to use portable covers all shortwave frequencies plus AM & FM. With keypad entry and digital readout, you won't miss any of the international action!



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| Mon. - Fri. | 10:00-5:30 |
| Thursday | 10:00-7:00 |
| Saturday | 10:00-3:00 |
| Sunday | CLOSED |

PROPAGATION CONDITIONS, UNITED STATES

LET'S TALK THE SAME LANGUAGE!

By Jacques d'Avignon
 monitor@rac.ca

PART 2

This month you will find the second of three parts of a glossary of terms that apply to radio propagation and radio propagation forecasting.

Ground Wave

The radio wave which propagates close to the Earth's surface. Severe signal losses due to ground resistance limit the range of ground waves to about 100 km over land and 300 km over sea for the lowest HF frequencies. The ground waves for the higher HF frequencies cover much shorter distances.

Hop Length

The distance a radio wave travels with one reflection from the ionosphere. It will depend on the antenna elevation angle and the height of the reflecting layer.

Ionosphere

That part of the atmosphere that is ionized by the sun's radiation. Extends upwards from about 60 km. The free electrons in the ionosphere support radio wave propagation.

Lowest Usable Frequency (LUF)

The lowest frequency which allows an acceptable grade of HF service.

Maximum Usable Frequency (MUF)

This is the highest frequency for reliable radio communications by the ionosphere. The median MUF is the highest frequency that will be usable at a particular hour for at least 50% of the days of the month.

Multipath Fading

Small time delays can occur in radio signals traveling by a single mode (due to irregularities in the ionosphere) or by mixed modes. The superposition of these multiple echoes will degrade the quality of the received signal.

Optimum Working Frequency (OWF)

This is the lower decile MUF. It is the frequency which is usable for at least 90% of the days of the month.

Polar Cap Absorption (PCA)

The ionization of the D region over the polar latitudes by high energy solar protons causes radio blackouts for trans-polar circuits which can last for several days. PCAs are almost always preceded by a major solar flare on the visible hemisphere of the sun. The time between the flare event and the onset of the PCA ranges from a few minutes to several hours.

Proton Flare

A flare that liberates significant amounts of high energy protons. If this stream intercepts the earth, the protons cause a polar cap absorption (PCA).

OPTIMUM WORKING FREQUENCIES (MHz)

For the Period 15 October to 14 November 1997 Flux=89 SSN=32

| UTC | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
|------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| TO/FROM US WEST COAST | | | | | | | | | | | | | | | | | | | | | | | | |
| SOUTH AMERICA | 24 | 18 | 13 | 12 | 11 | 11 | 11 | 11 | 9 | 9 | 10 | 9 | 11 | 18 | 23 | 24 | 24 | 25 | 25 | 26 | 26 | 25 | | |
| WESTERN EUROPE | 9 | 9 | 9 | 8 | 8 | 8 | 8 | 8 | 9 | 8 | 8 | * | * | * | 12 | 16 | 19 | 19 | 18 | 16 | 13 | 11 | 10 | 9 |
| EASTERN EUROPE (P) | 7 | 8 | 7 | 7 | 8 | 9 | 9 | 9 | * | * | * | * | * | 9 | 10 | 15 | 14 | 11 | * | * | * | * | * | * |
| MEDITERRANEAN | 12 | 11 | 11 | 11 | 10 | 10 | 10 | 10 | * | * | * | * | * | * | 13 | 17 | 20 | 20 | 15 | 13 | 12 | 12 | 12 | |
| MIDDLE EAST (P) | 11 | 11 | 12 | 12 | 10 | * | * | * | * | * | * | * | * | 9 | 10 | 13 | 13 | 12 | 11 | * | * | * | * | 11 |
| CENTRAL AFRICA | 19 | 17 | 13 | 11 | 11 | 10 | 10 | * | * | * | * | * | * | * | 17 | 22 | 23 | 23 | 23 | 21 | 22 | 23 | 23 | 21 |
| SOUTH AFRICA | 17 | 15 | 13 | 11 | 11 | 11 | * | * | * | * | * | * | * | 19 | 24 | 24 | 24 | 24 | 22 | 20 | 19 | 18 | 18 | |
| SOUTH EAST ASIA (P) | 23 | 22 | 20 | 15 | * | * | * | * | * | 10 | 9 | 9 | 9 | 10 | 11 | 15 | 14 | 14 | 12 | * | * | * | * | 13 |
| FAR EAST | 23 | 22 | 19 | 14 | 11 | 10 | 9 | 9 | 10 | 9 | 9 | 9 | 9 | 9 | 10 | 10 | 10 | 10 | 9 | 11 | 17 | 22 | 23 | |
| AUSTRALIA | 21 | 22 | 23 | 18 | 14 | * | * | 12 | 11 | 11 | 11 | 10 | 9 | 9 | 12 | 14 | 14 | 13 | 15 | 18 | 19 | 20 | 21 | |
| TO/FROM US MIDWEST | | | | | | | | | | | | | | | | | | | | | | | | |
| SOUTH AMERICA | 18 | 13 | 11 | 10 | 10 | 11 | 11 | 11 | 9 | 8 | 8 | 9 | 10 | 15 | 20 | 22 | 23 | 23 | 23 | 24 | 24 | 24 | 23 | 22 |
| WESTERN EUROPE | 10 | 10 | 10 | 10 | 10 | 9 | 9 | 9 | 9 | 9 | 9 | * | 11 | 15 | 17 | 21 | 22 | 22 | 21 | 19 | 16 | 13 | 11 | 10 |
| EASTERN EUROPE | 7 | 7 | 7 | 7 | 8 | 9 | 9 | 9 | 9 | * | * | * | * | 11 | 15 | 17 | 15 | 12 | 11 | * | * | * | * | 8 |
| MEDITERRANEAN | 12 | 12 | 12 | 11 | 10 | 10 | 10 | 10 | * | * | * | * | * | 15 | 19 | 21 | 22 | 22 | 17 | 14 | 13 | 13 | 12 | 12 |
| MIDDLE EAST (P) | 11 | 11 | 11 | 10 | 10 | * | * | * | * | * | * | * | * | 11 | 15 | 16 | 14 | 12 | * | * | * | 11 | 11 | 11 |
| CENTRAL AFRICA | 17 | 14 | 12 | 11 | 11 | 11 | 11 | * | * | * | * | * | * | 18 | 22 | 24 | 24 | 25 | 24 | 22 | 22 | 23 | 23 | 21 |
| SOUTH AFRICA | 17 | 13 | 12 | 11 | 11 | 11 | 11 | * | * | * | * | * | * | 19 | 23 | 24 | 24 | 25 | 23 | 20 | 19 | 18 | 18 | |
| SOUTH EAST ASIA (P) | 21 | 19 | 15 | * | * | * | * | * | * | * | * | * | * | 9 | 9 | 9 | 9 | 11 | 15 | 14 | 13 | 13 | 12 | * |
| FAR EAST | 22 | 20 | 15 | 12 | 10 | * | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 10 | 11 | 11 | 10 | 11 | * | 12 | 18 | 23 | 23 | |
| AUSTRALIA | 21 | 22 | 17 | * | * | * | * | 11 | 11 | 11 | 11 | 10 | 10 | 10 | 12 | 15 | 14 | 13 | 13 | 15 | 18 | 19 | 20 | 20 |
| TO/FROM US EAST COAST | | | | | | | | | | | | | | | | | | | | | | | | |
| SOUTH AMERICA | 12 | 10 | 10 | 9 | 10 | 10 | 10 | 9 | 8 | 7 | 7 | 9 | 15 | 19 | 21 | 20 | 20 | 21 | 21 | 21 | 20 | 19 | 16 | |
| WESTERN EUROPE | 9 | 9 | 9 | 9 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 11 | 17 | 19 | 20 | 21 | 21 | 20 | 19 | 17 | 14 | 12 | 10 | 9 |
| EASTERN EUROPE | 8 | 8 | 8 | 8 | 8 | 9 | 8 | 8 | * | * | * | * | 10 | 15 | 18 | 19 | 17 | 15 | 13 | 11 | 9 | 8 | 8 | 8 |
| MEDITERRANEAN | 12 | 11 | 10 | 10 | 10 | 9 | 9 | 9 | * | * | * | * | 13 | 18 | 21 | 22 | 23 | 23 | 22 | 17 | 14 | 13 | 13 | 12 |
| MIDDLE EAST (P) | 11 | 11 | 11 | 11 | 10 | 10 | * | * | * | * | * | * | 12 | 17 | 20 | 21 | 18 | 15 | 13 | 12 | 11 | 12 | 12 | 12 |
| CENTRAL AFRICA | 13 | 12 | 12 | 12 | 12 | 12 | 11 | 11 | * | * | * | * | 15 | 20 | 23 | 25 | 25 | 26 | 24 | 22 | 23 | 23 | 20 | 16 |
| SOUTH AFRICA | 13 | 12 | 12 | 12 | 11 | 12 | 11 | * | * | * | * | * | 16 | 22 | 24 | 25 | 25 | 25 | 23 | 21 | 20 | 19 | 16 | |
| SOUTH EAST ASIA (P) | 15 | 13 | * | * | * | * | * | * | * | * | * | * | 9 | 12 | 15 | 16 | 14 | 13 | 12 | 12 | 11 | 11 | 10 | 11 |
| FAR EAST | 18 | 14 | 12 | * | * | * | * | 10 | 10 | 9 | 9 | 9 | 10 | 11 | 11 | 11 | 11 | * | * | * | 12 | 16 | 21 | 21 |
| AUSTRALIA | 20 | 15 | * | * | * | * | * | 11 | 11 | 11 | 10 | 10 | 10 | 14 | 16 | 15 | 14 | 13 | 13 | 15 | 18 | 19 | 19 | 20 |

*Unfavorable conditions: Search around the last listed frequency for activity.

Reflection

Although a radio wave is actually refracted in the ionosphere, it is often permissible to substitute a simple triangular ray path for the real ray path, as if the ray were reflected from a mirror. Thus radio waves are often referred to as being reflected from the ionosphere.

Refraction The bending of a wave when it crosses a boundary between media due to a change in velocity of the wave. Until it reaches the ionosphere, a radio wave propagates in a straight line. Once in the ionosphere, it is refracted back towards the ground. The amount

of refraction depends on the electron density of the ionosphere and the operating frequency.

Skip Distance The minimum distance from the transmitter for which a sky wave will return to earth when the operating frequency exceeds the vertical incidence critical frequency. Within the skip distance, only ground wave propagation is possible. The only way to reduce the skip distance is to lower the operating frequency.

Sky Wave The radio wave which propagates through the ionosphere. It is often called the ionospheric wave to distinguish it from the direct (line of sight) wave and the ground wave.

When Any "Q" Just Won't Do

It's funny how this column works sometimes. I can go for months, even years without receiving any questions or queries concerning a particular topic. Then, out of the blue, I can get half a dozen letters or emails about the same subject. One such topic has floated to the surface. As a matter of fact it surprises me that it hasn't come up in the past. Now that I think of it, it is something that can be very confusing to the beginners in our hobby. That topic is "Q" Signals.

Originally designed for International Morse Code operation, "Q" signals can turn up anywhere. I've heard the terms "QSO," "QRM," "QTH," and "QRT" spoken by police departments on my scanners. I've had hobbyists walk up to me at radio conventions and say "QRU?" I've sent and received "QSL" cards, I enjoy operating "QRP" and I read "QST" every month.

Technically, "Q" signals are regulated by the international Telecommunications Union as a standard set of abbreviations for use with the international Morse code. However, if you check their Internet Website and run a search, it appears that they don't give much thought to them these days. Most of the "Q" signals in common usage are more a matter of mutual agreement than international regulation. Beyond the conventions of the hobby, organizations such as the American Radio Relay League have even established subsets of "QN" signals designed exclusively for use in CW net operations.

So even though some "Old Timer" might get on two meters and scold you for using "Q" signals in voice mode, the general rule with "Q" signals seems to be that they are used by any two or more folks who agree to use them in their communication, CW, RTTY, voice, or whatever mode. (Now *that* should generate a little mail). Get over it folks! If you've been reading this magazine for the last few issues you know that Uncle Sam is breathing down our necks about much more important things than our "inappropriate" use of "Q" signals. Anyway, you loyal readers of the *Beginner's Corner* asked for it, so here's a look at the current crop of commonly used "Q" Signals.

QRA - The first thing to remember is that "Q" signals can be used as either a statement or a question. Let's use the first "Q" signal as an example. If someone sent me (using the CW mode) **QRA?** (note the question mark),

they are asking "What is the name of your station?" You would respond "QRA is N2EI."

QRG - means "My exact frequency is..." Suppose someone is trying to "zero beat" your signal for maximum efficiency. You may have enough information about your transmission (e.g., crystal control) that you can send "QRG is 7150 kHz."

QRH - Usually sent as a question (QRH?), this means "Does my frequency vary?" A response might be "QRH 5 kHz" to indicate the amount of signal drift you have detected.

QRI - Also often sent as a question (QRI?), the sender wants to know "How is my tone?" This is usually important in CW operations. A response would be "QRI 3." Tone is usually judged on a scale of 1 through 5, with 1 being nearly unintelligible and 5 being excellent.

QRK - Similar to QRI, it refers instead to signal intelligibility. You would respond to "QRK?" by sending back "QRK 4," again using the 1 through 5 rating system.

QRL - Again, most often heard as a question, it is a quick way of asking "Are you busy?" If you send "QRL?" and hear back "QRL" and nothing more, check back with your friend a little later. Very useful in net operations.

QRM - Heard all too often, "QRM" means "My transmission is being interfered with." With narrow filters, directional antennas, and propagation effects, interference can be unintentional. Best to just "QSY." (See below.)

QRN - Sometimes confused with "QRM," "QRN" refers to static and atmospheric noise as opposed to interference from another station or service.

QRO - is sent when you want the station on the other end to increase their power. Common usage among the amateur community is in reference to stations or equipment capable of operating at full legal power. (e.g., "John just bought a QRO amplifier.")



QRP - is sent to request a reduction in power. Remember that FCC and international regulations expect a station to use the least amount of power for good communication to avoid interference. Maybe somebody should explain this to the "pager" industry and those AM broadcast stations that run 150% modulation. The

term also refers to that subculture in ham radio that likes to operate with equipment running under 5 watts. A further unofficial use is QRPP which is used to refer to operation with less than 1 watt. You'd be amazed at how far you can get on a couple of milliwatts.

QRQ - is usually heard in the realm of those speed demons on the low end of the Extra Class portions of the bands. This means "Send faster."

QRS - Most often heard in the Novice Class CW bands, this signal means "Send slower."

QRT - Used to indicate that you are about to stop transmitting. You will often hear voice operators saying they are "Going to go QRT for dinner." This indicates that you are shutting down your station.

QRU - Most often heard as a question, it technically means "Do you have anything for me?" Many hams use it as a way of saying "What's up?" or "What's happening?"

QRV - is sent to indicate readiness. Let's say you are about to send somebody a long piece of traffic. You want to make sure they have their pencils and paper in place so you send "QRV?" If they come back with "QRV" you can start your traffic.

QRW - If you're calling someone and they can't hear you, another station can indicate their ability to relay your signal by sending "QRW." It can also mean "I can tell (whoever) that you are calling them." This would indicate the ability to establish a "QSP." (See below.)

QRX - would probably be sent by my

mother if she were a ham. It most often appears as a question and it means "When will you call again?" You would use this to set up a "sked." "QRX Wed 1400 7150" means you'll try to communicate on Wednesday at 1400 hours UTC on 7150 kHz.

QRZ - Sent as a question, it means "Who is calling me?" Often heard during contest operations to indicate someone is on frequency and waiting for stations to call them. The more technically correct use is to get a fill in on a partial callsign.

QSA - indicates signal strength. Sending "QSA 5" indicates excellent signal strength, again using the 1 through 5 scale.

QSB - is used to indicate fading, usually due to propagation losses along the signal path. If you were to indicate "QSB," you and your contact might "QRS" and "QRO" in an attempt to improve "QRK."

QSD - Here's one that is on the list that I've never heard sent. "QSD?" asks the question "Are my signals mutilated?" I would think if things were that bad no communications would be established.

QSG - is used in traffic handling to indicate the number of messages you want sent at a time. "QSG 5" would indicate that you want the other station to send five messages in each transmission.

QSK - indicates a particular kind of CW operation called "Break in." "QSK" indicates a station that has the ability to receive between the dots and dashes that are sent in CW. This can be important in an emergency because, while a station is sending a transmission, they can hear another station attempting to "break in," allowing the sending operator to stop and hear the breaking station. This is also useful in contests, as a station can "break in" to your call for contacts, thereby saving time. You'd be surprised how much information can sneak in between those dots and dashes.

QSL - Even beginners have heard this one tossed around. Technically this means "I acknowledge receipt." On the air it is used to indicate that you got the message. It is also used to refer to the confirmation (QSL) cards that amateurs swap as record of their contacts. Also, many shortwave broadcast stations send out QSL cards in response to signal reports sent in by listeners.

QSM - is sent when you want the station to repeat their last message. Under conditions of "QSB," you may have to "QSM" several times before you can "QSL."

QSO - generally refers to any radio contact, but it has a specific technical meaning. "QSO" is an indication of direct communication between two stations without relays (QSP).

QSP - If you can't establish a "QSO" you may need to ask someone to "QSP." This indicates relaying a signal between two stations.

QST - In addition to being the name of the ARRL magazine, "QST" indicates a message sent to all amateur radio operators listening. It is an indication of a message of general interest to the ham community, such as a bulletin.

QSV - The most obvious of "Q" signals means "Send a series of the letter "V." This can be used to help a station "zero beat" or get exactly on the frequency of operation.

QSW - indicates transmitting frequency. "QSW 7150" means "I will transmit on 7150 kHz."

QSX - indicates receive frequency (not always the same as transmitting frequency). "QSX 7200" means "I will receive on 7200 kHz."

QSY - indicate a frequency change. You will often hear "QSY up 5" to indicate that the station is moving its operation up 5 kHz in frequency, often to avoid "QRM."

QSZ - This is used in message transmission to tell the station to repeat words to assure clarity. "QSZ 2" means "send every word twice."

QTA - indicates canceling a particular message in a group. "QTA 3" indicates canceling message number 3.

QTB - is sent as a question to check the word count of a message. "QTB 50?" answered by "QTB 50" would mean the message went through intact.

QTC - indicates the number of messages sent. "QTC 10" means ten messages were sent.

QTH - I've even heard this one used on Citizens Band. "QTH" identifies location. My QTH is New Jersey. Bob Grove's QTH is Brasstown.

QTR - is used to ask for or send a time check. If you send "QTR?" and the other station responds "QTR 1200," this indicates the current time is 1200 UTC.

QTV - indicates that you will wait on frequency for someone. "QTV?" would ask the question "Shall I stand by for you?"

QTX - means "I will keep my station open." Think of it as the opposite of "QRT."

QUA - means "I have news of ..." A QST is usually a signal that will contain "QUA."

Well, there you have a good list of common usage "Q" signals. Use them at your discretion. Remember, they only convey the message intended if both you and the station on the other end know what they mean. Otherwise you will need to QSM in plain language. QSL?

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We Have Our Winners!

A few months ago, we challenged readers to submit their all-time best intercepts in the Longwave DX Award (LDXA) contest. Dick Pearce (VT) racked up a total score of 409 points—and he did it with just 10 beacons—all of which were 25 watt stations.

As you may recall, the contest did not require just pulling in long distance contacts, but instead, focused on the *power output* of the stations. Dick could have claimed a few of his South American catches—and amassed an impressive mileage score in the process—but it was *miles-per-watt* that counted in this contest. As Grand Prize Winner, Dick will receive a copy of *The Art of NDB DXing* by Sheldon Remington, 1988 (re-published by Stephen P. McGreevy, Oct. 1996).

Allen Renner (PA) was our second runner-up with 211 points. Allen achieved this score by also focusing on 25 watt stations. His receiving equipment consists of a Realistic DX-440 receiver and a Homespun Loop as described in the September '92 *Below 500 kHz*. As 2nd place winner, Allen will receive a copy of the cassette tape *VLF RADIO! "The Sounds of Longwave."*

Congratulations to both of our winners, and to all who participated in the contest. Each contestant will receive an LDXA wall certificate for their efforts. The winning entries from both Dick and Allen are listed below in Table 1.

TABLE 1. LDXA WINNING ENTRIES

| FREQ. | ID | LOCATION | MILES/WATT | BY |
|-------|-----|--------------------|------------|------|
| 290 | TVK | Centerville, IA | 41 | D.P. |
| 353 | QG | Windsor, ONT | 17 | A.R. |
| 385 | HYX | Saginaw, MI | 20 | A.R. |
| 397 | A | Hamilton, ONT | 13 | A.R. |
| 398 | G | Windsor, ONT | 17 | A.R. |
| 417 | EOG | Greensboro, AL | 34 | A.R. |
| 417 | HHG | Huntington, IN | 21 | A.R. |
| 417 | IY | Charles City, IA | 38 | D.P. |
| 419 | RYS | Grosse Isle, MI | 17 | A.R. |
| 421 | EF | McKinney, TX | 56 | D.P. |
| 423 | CKP | Pilot Rock, IA | 45 | D.P. |
| 423 | DXE | Dexter, MO | 32 | A.R. |
| 423 | DXE | Dexter, MO | 42 | D.P. |
| 424 | RVJ | Reidsville, GA | 35 | D.P. |
| 426 | FTP | Ft. Payne, AL | 35 | D.P. |
| 426 | Izs | Montezuma, GA | 38 | D.P. |
| 429 | IKY | Springfield, KY | 22 | A.R. |
| 432 | IZN | Lincolnton, NC | 18 | A.R. |
| 432 | MHP | Metter, GA | 35 | D.P. |
| 518 | GCT | Guthrie Center, IA | 44 | D.P. |

Reader Request

Tod Warr (PA) was one of the many people that responded to my request for a Realistic DX-160 service manual. He has an equipment need that I'd like to share with readers. He is looking for a Science Fair Globe Patrol shortwave re-

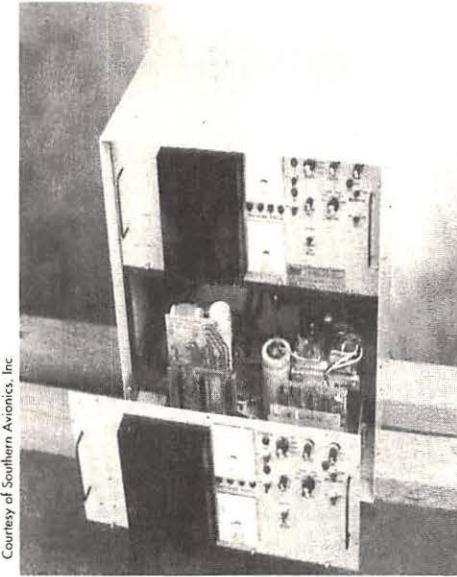


FIGURE 1. Beacon Transmitter

ceiver (Radio Shack #28-205) as well as a Zenith "Owl" radio in any condition. The latter set was a promotional radio put out by Zenith around 1976. It has an owl's head sticker by the tuning window and is for AM broadcast only. If anyone has information on where these sets might be found, please drop me a note and I'll pass it on.

Homebrewer's Challenge

At first it wasn't so bad. Marine beacons (285-325 kHz) that were converted to Differential GPS (DGPS) kept their traditional Morse Code ID—even though it was sent in a warbled fashion. Within a year, however, the Morse ID was dropped entirely on most DGPS beacons, putting an end to DXing them in the traditional sense. Can the FAA beacons be far behind? I believe now is the time for action.

I'd like to challenge our technically-inclined readers to design a simple circuit for decoding the DGPS data stream. Ideally, this would require only a handful of parts and connect directly to a PC for display of the data. It's my understanding that the data stream contains an ID number that could be read and used to locate a particular station. (Many of these ID numbers are in fact listed on the Internet at: <http://www.starlinkdgps.com/gpsinfo.htm>)

We won't go into technical detail here about DGPS signals, other than to say that they are sent using Minimum Shift Keying (MSK) at speeds of 100 and 200 bps. Details on the DGPS protocol are given in the Radio Technical Commission on Marine Services (RTCM) publication SC-104, which can be obtained

from the RTCM, P.O. Box 19087, Washington, DC 20036.

Another excellent source for general DGPS information can be found on Starlink's Web site at: <http://www.starlinkdgps.com/gpsinfo.htm>. How about it? Can anyone out there suggest a suitable design? I would be happy to present this as a construction project in *Below 500 kHz*.

■ NDBs—A Look Inside

If you've been a reader for very long, you know that I enjoy showing what's behind the signals we hear. To get a look at the inside of a beacon transmitter, I turned to Southern Avionics, Inc., one of the leading manufacturers of Non-Directional Beacon (NDB) equipment.

Jerry Ellis of Southern Avionics supplied a picture of one of the firm's most popular transmitters (see figure 1). There are actually two transmitters in the enclosure—one main, and a backup that takes over in the event of a failure in the main unit. Many of the beacon signals you hear probably originate from a unit such as this.

Southern Avionics also makes antennas, couplers, alarm receivers and many other beacon accessories. Their web site has some excellent write-ups on how beacons are used and what is required for typical installations. You'll find it at www.southernavionics.com/.

■ End Notes

If you live in the Northeastern U.S., keep an ear open on 185.000 kHz later this fall for my Lowfer beacon "KC." After many years of inactivity, I am planning to resurrect this station and would appreciate reception reports from *MT* readers.

As always, I'd enjoy hearing from you with your loggings, questions and comments for *Below 500 kHz*. Send your letters to Monitoring Times, P.O. Box 98, Brasstown, NC 28902. An SASE guarantees a response. See you next month!

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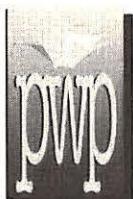
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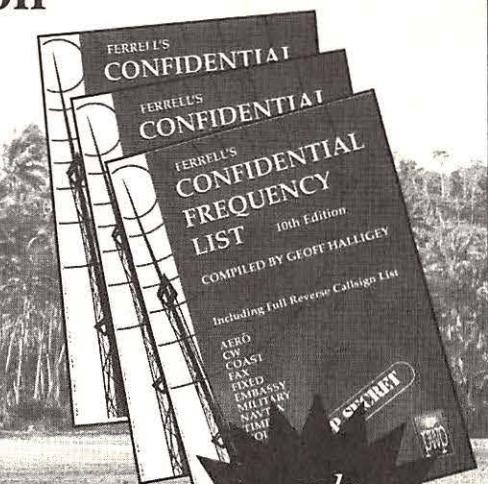
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Myths of the Domestic Dials

I'm sure we're all familiar with the "urban legend." These are stories that just won't die, no matter how often they're refuted. Domestic broadcasting has its own myths, and I'm going to take some space this month to burst a few bubbles.

The longest-lived myth is that of trans-Atlantic delayed reception of Houston TV station KLEE-TV, three years *after* the station changed its call letters to KPRC-TV. This reception occurred in 1953—at the height of the Cold War and UFO mania. As you might expect, some rather exotic (and occasionally paranoid) theories were developed to explain this one. Unfortunately, the real explanation of this reception—a hoax pulled off by some British con men trying to attract investors to a "light cell" antenna—didn't get nearly as much press. (See June 1996 *American Bandscan* for more information on this incident)

Another myth that keeps rising from the dead is the belief that the FCC is about to ban religious broadcasting. This one got its start in 1975. Two individuals with a long history in community radio filed a petition asking that the Commission consider changing its rules to prevent religious organizations from building stations on FM frequencies and TV channels reserved for educational use.

Their petition did *not* propose to prohibit religious stations on unreserved, commercial frequencies, nor did it propose to prohibit stations operated by commercial outfits or community organizations from airing religious programs. In any case, it became a moot point on August 1 of 1975 when the FCC decided the Constitution prevented it from discriminating between secular and religious educational institutions. The petition was denied.

But not until a whole lot of paper was wasted! Rumors spread that atheist activist Madalyn Murray O'Hare had filed a petition to prohibit the licensing of religious stations. Other rumors suggested all religious programs—even Sunday morning church services on normally secular stations—were to be banned. The Commission estimated that it had received over 700,000 informal letters urging the preservation of religious broadcasts.

One would think the paper avalanche would have stopped when the FCC denied the re-

quest. It didn't. Even though over 20 years have passed, FCC officials say they still receive hundreds of letters from citizens fearing the removal of all religious programs from the airwaves. In fact, the original August 1975 decision is still posted on the FCC Web page (www.fcc.gov/mmb/asd/decod/doc/letter/1975-08-13-religious.html), the only 20-year-old document on their Internet site. If someone in your church asks you for the FCC's address to file comments on this issue, please do the Commission a favor and show them a copy of this document!

Some more recent rumors have to do with the new digital TV system. One correspondent was told the new DTV receivers would be programmed with your ZIP code, and would refuse to receive any TV stations not licensed to cover your community. Obviously, this would be a severe problem for TV DXers!

I suspect this one came from a DSS satellite subscriber. When you sign up for DSS satellite service, you can request access to ABC/CBS/Fox/NBC affiliates over the satellite. However, this access can only be granted if you live in an area where these signals cannot be received over the air with a rooftop antenna. The DSS distributors must forward your location to the local network affiliates, who must agree that you live in an area of poor reception. My guess is that someone got this process confused with the new DTV system.

Another recent rumor is that, even without ZIP code restrictions, DTV (and digital radio) cannot be DXed. DXing will certainly be *different* in digital, just as scanning changes when your local fire department moves from low-band to a trunked system. But switching from analog to digital doesn't change the laws of nature and signal propagation. A signal on 500MHz (channel 18) will travel through a tropospheric duct with equal ease if it's an analog TV signal, a digital TV signal, or even a land-mobile two-way FM signal. Don't throw

out your antennas; TV DX will be around for decades to come.

Bits and Pieces

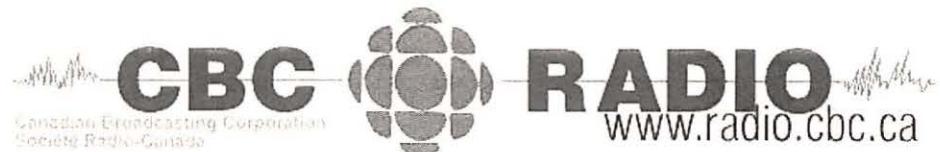
The Canadian Radio-Television Commission has struck again. Early in July, three major CBC AM stations in Quebec (690 and 940 in Montreal, and 980 in Quebec City) were granted permission to move to the FM band.

Now, the most widely-monitored CBC AM station will also be disappearing. CBL-740 Toronto has been granted permission to take over the old CKO-FM frequency (99.1MHz, 35.2 kW from the CN Tower). The AM station will continue to operate for 6 months after the FM comes on the air. I suspect the old CKO-FM transmitter may still be in place—and the tower and transmitting antenna definitely are—so if you live in the Toronto, Buffalo, Hamilton, or Rochester areas you may well be hearing the CBC on FM by the time you read this.

If the FM transmitter does come on the air as soon as I suspect, CBL AM will be disappearing in the middle of the 1998 DX season. KTRH-740 Houston will probably replace CBL as the most-heard station on radios in the region. However, I also expect one of Toronto's other AM stations to take over the 740 frequency, so it may not be open for long.

Incidentally, FM DXers in the area will also find new relayers of the new CBC FM station on 89.1 at Paris and on a yet-unassigned frequency (probably 90.5) at Crystal Beach. CBCO-91.5 Orillia will increase power from 3100 watts to 5200.

The window for expanded-band AM applications has now closed. Much to my surprise, only about half of eligible stations seem to have applied. The FCC hasn't yet acted on any of these applications, but I would expect to begin hearing additional expanded-band



Some of Canada's most popular DX catches belong to the CBC—and will be disappearing soon. Be sure to log the CBC stations on 690, 740, 940, and 980 kHz before they become a part of history!

Netscape: The Boston Radio Dial: AM

Back Forward Home Edit Reload Images Print Find Stop

Location: <http://radio.lcs.mit.edu/radio/amdial.html>

What's New? What's Cool? Destinations Net Search People Software

The Boston Radio Dial: AM

Links from the frequency or call of a particular station lead to historical information about that particular frequency or call; "Follow Me" links in the format section lead to the station's own on-line presence. The format of individual entries is described [here](#).

Freq Call City (Format) Format

- 330 WPBG709 Weston (10 ND); Macquire TBS
- 920 WECE Boston (9000 DA-1); Religion
- 650 WRPT Ashland (CP 250 ND-2); Talk America
- 1060 WJLT-Nashville (5000 DA-1); Religious
- 145 WJIB Cambridge (250 ND); Broadcast Music
- 1250 WEII Boston (5000 DA-2); Follow Me!
- 1520 WEPF-Dasham (2500/5400 DA-2); Leased Ethnic
- 1200 WRGL Boston (5000/90 ND); Leased Religion
- 1200 WBZ Boston (5000 DA-1); Follow Me!
- 1060 WJLT-Nashville (500 ND-2); Follow Me!
- 1050 WILD Boston (5000/25 ND-2); Urban
- 1120 WADN Concord (5000/1000 DA-2); Eltonberg, Folk weekends
- 1150 WNET Boston (5000 DA-2); //WAFF
- 1200 WKOZ Framingham (10000/1000 DA-2); Ethnic, Talk
- 1230 WESX Salem (1000 ND); Standards, News, Talk
- 1260 WFZE Boston (5000 DA-2); Religion
- 1300 WIDA Quincy (1000 ND); Standards, News, Talk, Leased Ethnic
- 1300 WCAW-Waltham (5000 DA-1); Leased Ethnic
- 1300 WLTN Lynn (5000/1000 DA-2); Music
- 1450 WEDN-Danvers (5000/1000 DA-2); Music
- 1450 WHRB Boston (5000 DA-2); Follow Me!
- 1520 WPTW Newton (1000 ND-2); Leased
- 1570 WNSL-Beverly (500 DA-2); AC
- 1600 WJUN Brookline (5000 DA-1); Leased

Adjacent Markets: Merrimack Valley, Worcester County, Rhode Island, Southeastern Mass., Cape Cod

The Boston Radio Archives: radio.lcs.mit.edu/radio/bostonradio.html

radio.lcs.mit.edu/radio/amdial.html

The Boston AM Radio Dial is just one of a variety of interesting items on the Boston Radio Archives Web Page. Take a look at radio.lcs.mit.edu/radio/amdial.html.

stations in a few months.

A. Joseph Ross of Boston wrote to pass along information of value to New England DXers. He's a member of the Boston Radio Mailing List on the Internet. (boston-radio-interest-request@mercury.lcs.mit.edu to subscribe) And, he suggests a look at the Boston Radio Archives Web Page (radio.lcs.mit.edu/radio/bostonradio.html) for historical information about AM, FM, and TV stations in the area.

New England DXers who don't have access to the Internet aren't left out, though. Bob Bittner (who I believe is also a DXer) hosts the 30-minute program "Let's Talk About Radio." It airs Sundays at 12:05PM on WJIB-740 Cambridge, WNEB-1230 Worcester, and WJTO-730 Bath; and Saturdays at 9AM on WKBR-1250 Manchester.

Ross also corrected something I wrote in May about silent stations beating the deadline for returning to the air. I listed WRPT-650 as a New Hampshire station; he notes it moved to Ashland, Massachusetts, to return to the air. WRPT and WJLT-1060 both use the WKBR-1200 towers in Framingham.

SW and AM DXer Sandra Piotrowski of suburban Detroit got in on a bit of FM DX in late June. While camping, Sandra hooked her SuperRadio to the poles on the awning of her camper, trying to receive local WRIF-101.1. At 8:45pm, she got a clear ID from KFDI-FM (101.3) Wichita, Kansas. The signal was intermittent but strong. During the hour-long sporadic-E opening, Sandra also got a posi-

tive ID from KSLS-101.5 Liberal, Kansas. She's sent reception reports & is awaiting some QSLs.

Unfortunately, it was a very poor sporadic-E season this year. However, there have been a few other reports of good reception like Sandra's. We're now at the peak of the tropospheric bending season for DXers in the Great Lakes and Atlantic Coast regions. And, of course, as the nights get longer the AM band gets better. If you haven't logged the CBC on AM yet, you'd better start now; several of the strongest outlets will be gone by the time the 1998-1999 DX season starts. What are you hearing? Write me at Box 98, Brasstown NC 28902-0098, or by email at 72777.3143@compuserve.com.

DX TEST

Saturday, October 4, 1997: KTGG-1540, c/o Spring Arbor College, 106 East Main Street, Spring Arbor, MI 49283 will conduct a DX test at 450 watts nondirectional between 12:00 & 12:30 am EDT. The test will include classical, march, and Christian rock music, plus voice IDs, test tones and Morse code IDs. Reception reports may be sent to: Mr. Lewis Munn - Chief Engineer. (Test arranged by J.D. Stephens). E-Mail: lmunn@admin.arbor.edu; Web: <http://www.arbor.edu/wsa/kogg.htm>

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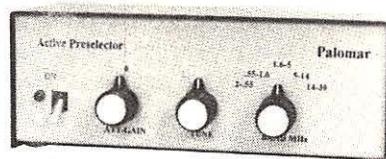


Your longwire may be up in the clear but the wire to the radio picks up noise from light dimmers, TV set, fluorescent lights, etc.

Coax shields out this noise but has far lower impedance than the antenna. Palomar's MLB-1 balun transforms the impedance to give a stronger quieter signal. Static charges go to ground, not through the radio.

Model MLB-1 \$49.95
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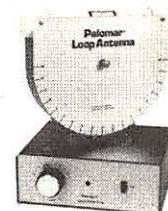
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Palomar's Active Preselector gives over 20 dB extra gain. Eliminates images and adds selectivity to your receiver. New amplifier circuit reduces spurious outputs. Continuous coverage 200 KHz to 30 MHz.

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FM Pirates Increasingly Active in USA

Scores of local FM pirates operate daily across the United States. They aren't as well organized in a national network as their shortwave cousins. Their signals generally get out only a few miles. But given their large numbers, they have a substantial nationwide audience.

Scott Krauss of Cleveland, Ohio, sends in press accounts of **WSPL**, operating as a commercial Hispanic station on 90.7 MHz in Cleveland, Ohio. I hear their Puerto Rican Salsa throughout Cleveland and some of its inner suburbs. *The Cleveland Free Times* speculated that the FCC is enforcing local FM pirates very gingerly, pending the outcome of litigation still in progress on Steve Dunifer's **Radio Free Berkeley** in California.

Raymond Gramm of Seminole, Florida, sends in a *St. Petersburg Times* article about five different pirates operating in the Tampa area on 88.0, 89.3, 90.1, 96.7, and 102.1 MHz. Jeff Ryan in Yardley, Pennsylvania, heard **WXFG** in Trenton, New Jersey on 105.7 MHz. On the way back from a Phillies game, he also heard **WZXI** on 95.3 MHz from Philadelphia, announcing a phone number of (215) 404-0040. Finally, Harold Frogde of Midland, Michigan, notes that his local pirate on 88.3 MHz now identifies itself as **Tower Boy Network**.

■ Metallica News

Dr. Tornado, who took the pirate world by storm this summer with his daily pirate activity using a 10,600 watt transmitter, makes news once again this month. Since his 100th transmission, he's scaled back his formerly near-daily schedule. But, the station is still active. Look for its new service on 11885 kHz. Given current propagation conditions, the 11 MHz shows are skipping over many listeners in eastern North America, but Shawn Axelrod in Winnipeg, Manitoba, Kenny Love in Columbia, South Carolina, and William Hassig in Mt. Prospect, Illinois, all heard one!

As we see here this month, hundreds of QSL's are arriving from both Metallica and from Metallica parody **Radio Tornado Worldwide**. Dr. Tornado tells *MT* that although he used many transmitter parts and subassemblies from George Donahue of



WJDI, much of the construction work on Metallica's superpowered wideband audio transmitter was completed by Dr. Tornado himself.

■ Radio London Returns

Radio London, known as the "Big L" and "Wonderful Radio London" during its 1967 run from the *Galaxy*, a converted World War II minesweeper in the North Sea, returned to the airwaves in July and August on 266 meters medium wave. This time the pirate had a license from the Radio Authority in the UK, in commemoration of the 30th anniversary of a British government crackdown on offshore pirates. Original DJ's were reunited to host the station's original playlist of rock, with proceeds donated to charity.

This station claims the world's first radio broadcast of the Beatles' *Sgt. Pepper's Lonely Hearts Club Band* album. Its jingles survive on an early rock album from The Who. Thanks to Dave Alpert of New York City, who forwarded a Reuters news item on the special broadcasts.

■ Radio Jemima

Rob Ross of London, Ontario, sends in multiple logs of New Zealand pirate **Radio Jemima**. They operate on 7475 kHz in the 0600-0800 UTC range, sometimes relaying **KIWI** broadcasts. Dick Pearce also heard them in Brattleboro, Vermont. Rob already has their QSL from PO Box 16-002, Tamatea,

Napier, New Zealand. In a related matter, Graham Barclay of **KIWI** says that **kiwiradio@writeme.com** is the new e-mail address for his weekly internet pirate newsletter.

■ What We Are Hearing

Your pirate loggings are always welcome via PO Box 98, Brasstown, NC 28902, or via the e-mail address at the top of the column. All frequencies are in kHz, with times in UTC.

North American pirate stations listed here use the following addresses: PO Box 1, Belfast, NY 14711; PO Box 109, Blue Ridge Summit, PA 17214; PO Box 28413, Providence, RI 02908; PO Box 146, Stoneham, MA 02180; PO Box 11522, Huntsville, Alabama 35814; and PO Box 293, Merlin, Ontario N0P 1W0. For return postage, enclose three 32¢ stamps in the envelope to USA addresses. \$2 US or two International Reply Coupons go to foreign maildrops.

6955 Radio- 6955 (what else?) at 0030. This new one features theme music from old TV shows, probably as a parody of Radio Metallica. Addr: None. (Chuck Morford, Fuquay-Varina, NC)

6YVOS- 6955 at 0100. Pigpen Marley usually mixes reggae music and marijuana promotions, but lately he's been adding Grateful Dead commemorations. Addr: Providence. (Matt Haston, Taylors, SC; Rich and Talea Jurrens, Katy, TX; Lee Silvi, Mentor, OH; Neil Wolfish, Toronto, Ontario; Axelrod)

Alan Masyga Project- 6955 at 2300. Their Alan Parsons Project rock music is dedicated to veteran DXer Alan Masyga. Addr: Providence. (Harold Frogde, Midland, MI; Jurrens; Silvi; Wolfish)

Altered States Radio- 6955 at 2145. William Hurt splices his rock music with comedy, sometimes from Beavis and Butthead. Addr: Merlin. (Michael Prindle, New Suffolk, NY; Frogde; Silvi)

Cherokee Radio- 6955 at 0415. Although their slogan is, "Native American Broadcasting," they primarily feature rock music. Addr: None. (Jurrens)

FBI Radio- 6955 at 0045. Ross reports a QSL from the pirates at Females Broadcasting Interference. Addr: Huntsville. (Ross Comeau, Andover, MA)

Free Hope Experience- 6955 at 0200. Major Spook is back with a mix of rock music and comedy, with CW Morse code identifications during broadcasts. Addr: Blue Ridge Summit. (Barry Williams, Enterprise, AL; Haston; Jurrens;

Majewski)

Free Radio Maker- 6955 at 2330. In July we asked for their address, which is PO Box 561, Postal Code 4330 A.N., Middelburg, The Netherlands. Thanks, William! (William Stibgen, Horsham, PA)

Friday Radio- 6955 at 2245. This one promotes the weekend, and broadcasts only on one day of the week. Guess which one? Addr: Providence. (Greg Majewski, Oakdale, CT; Haston; Jurrens)

Indira Calling- 6955 at 0000. This parody of **All India Radio** is mailing QSL's showing a map of Rhode Island, with all place names replaced by cities in India. Addr: Providence. (Frodge; Hassig; Silvi; Wolfish)

Jerry Rigged Radio- 6955 at 0130. Some of their recent rock music transmissions have been announced as low power ten watt QRP tests. Addr: Providence. (Axelrod; Haston; Jurrens; Silvi; Williams)

KOLD- 6955 at 0100. Aldo Batista, no relation to the former dictator of Cuba, is one of the few Big Band format pirates that has ever transmitted on shortwave. Addr: Stoneham, (Bill McClintock, Minneapolis, MN; Haston; Jurrens; Silvi)

KRAP- 6955 at 0200. Fred Flintstone's booming signal sends his rock music and mailbag shows throughout North America. Addr: Blue Ridge Summit. (Comeau; Frodge; Hassig; Haston; Jurrens; Love; Majewski; McClintock; Pearce; Silvi; Williams)

Lounge Lizard Radio- 6955 at 0000. Their lounge pop music comes from a different location on most shows. Recent lounges were named after **MT** columnists Glenn Hauser and George Zeller. Addr: Providence. (Ranier Brandt, Hoefer, Germany; Axelrod; Frodge; Hassig; Haston; Jurrens; Silvi)

Mystery Radio- 6955 at 0330. The distinctive new age and complex rock songs on this one make station IDs easy to fish out. Addr: Stoneham. (Jurrens; Silvi; Williams)

Not Radio Metallica- 6955 at 0100. Another parody of Dr. Tornado has emerged, with broadcasts in upper sideband. Addr: None. (Axelrod; Haston; Silvi)

Orbital Mind Control Satellite- 6955 at 2345. This old timer was formerly a rare catch, but they have been more widely heard on their recent programs with UFO themes. Addr: Belfast. (Frodge; Haston; Jurrens; Williams; Wolfish)

Radio Azteca- 6958 at 0200. Bram Stoker's clever parodies make fun of DXers and DXing, mainly from a pirate perspective. If you write in, he'll talk about you! Addr: Belfast. (Pearce; Silvi)

Radio Eclipse- 6955 at 0200. QSL's have been forthcoming from station maven Steve Mann, who uses a Johnson Viking Valiant with 150 watts for his AM broadcasts. He says that he's a regular **MT** reader. Addr: Providence. (Gary Neal, Sugar Land, TX; Brandon Artman, Westchester, PA; Axelrod; Frodge; Hassig; Haston; Jurrens; Love; Majewski; McClintock; Morford; Prindle; Williams)

Radio Free Euphoria- 6955 at 0130. Captain Ganja's cheerful humor makes him different from the other marijuana promotion stations. Addr: Belfast. (Axelrod; Brandt; Frodge; Haston; Jurrens; Morford; Prindle; Silvi; Williams)

Radio Fusion Radio- 6955 at 0045. They are the most active pirate with rap music programming, announced as coming from the "College of Knowledge." Addr: Providence. (Hassig; Love; McClintock; Silvi)

Radio Metallica Worldwide- 6955 at 0200. Dr. Tornado's frantic activity has slowed; see above. Addr: Blue Ridge Summit. (John Arendt, Oswego, IL; Rich Barnes, Springfield, IL; Robert Pote,

Greenwood, IN; Ken Coughlin, Shelby Township, MI; Howard Espravnik, Gallatin, TN; Tony Benbenek, East Hampton, NY; Artman; Axelrod; Hassig; Haston; Jurrens; Love; Majewski; McClintock; Morford; Neal; Pearce; Prindle; Silvi; Williams; Wolfish)

Radio One- 6950 at 0000. Bobaloo remains active with his slick productions of rock oldies music. He often inserts remarks on the history of the music. Addr: Belfast. (Haston; Majewski; Morford; Silvi)

Radio Tellus- 6955 at 0300. Look for the trademark "Oh, Yeah!" and the "Earth Station" slogan from this rock music pirate. Addr: Providence. (Axelrod; Morford; Haston; Jurrens; Silvi)

Radio Three- 6955 at 2330. Sal Amoniac's parody of the other "numbered" pirates plays intentionally syrupy music from the worst of rock oldies history. Addr: None, QSL's logs in *The ACE*. (Haston; Silvi; Williams)

Radio Tornado Worldwide- 6955 at 0030. Listen carefully if you hear Metallica, since this parody uses intentionally monotonous repeated recorded phrases from the real station. Addr: None; verifying logs in *The ACE* with the QSL that we see here. (Axelrod; Brandt; Frodge; Jurrens; Majewski; Silvi; Williams; Wolfish)

Radio Two- 6955 at 1300. Yabba Dabba Do started this station as a low budget parody of Radio One, but his low key rock oldies shows are entertaining. Addr: Providence. (Silvi; Wolfish)

Radio USA- 6955 at 1400. Mr. Blue Sky has been around for 15 years with his mix of punk rock, comedy, and DX commentary, sometimes via a Metallica relay lately. Addr: Belfast. (Chris Lobdell, Stoneham, MA; Barnes; Jurrens; Williams)

Radio Wolf International- 6955 at 1300. It's been a while since this multi-pirate station has been heard. WKND, KZAP, and Radio Flattus contribute to the in-studio banter. Addr: Blue Ridge Summit. (Comeau)

Radio XANAX- 6955 at 0200. They promote (and make fun of) the Xanax tranquilizer, with a slogan of "The Relaxation Station." Addr: Stoneham. (Barnes; Brandt; Frodge; Haston; Prindle; Silvi; Williams)

Redneck Radio- 6955 at 0400. This new one broadcasts country music with a southern announcer, but not much is known about it. Addr: None. (George Zeller, Cleveland, OH; Jurrens)

Take It Easy Radio- 6955 at 1630. Another new pirate; their southern accented announcer plays rock music by the Eagles. Addr: None. (Jurrens; Prindle; Silvi; Williams; Zeller)

Up Against the Wall Radio- 6955 at 2115. Using a klaxon "oogah" horn as an interval signal, Owsley recreates the mood of the late sixties and early seventies. Addr: Providence. (Silvi)

Voice of Anarchy- 6955 at 2030. Leonard Longwire has used highly varied musical styles on his programs over the years. His latest production asked for votes on various songs for a new USA national anthem, including "The Curly Shuffle." Addr: Blue Ridge Summit. (Espravnik; Haston; Jurrens; Majewski; Silvi; Wolfish)

Voice of Hell- 6955 at 2315. They often materializes on Halloween, but St. Lucifer's devil music also made appearances this summer. Addr: None. (Haston; Jurrens)

Voice of Shortwave Radio- 6955 at 0200. Rock and parody ads, a widespread pirate format, have aired on this new one. Addr: Blue Ridge Summit. (Artman; Axelrod; Hassig; McClintock; Silvi; Williams)

WARR- 6955 at 0330. After a wait of nearly a year, Captain No Beard's marijuana advocacy station has been sending out QSL's. As promised over the air, many include a "nickel bag," which is a nickel in a plastic bag. Addr: Belfast. (Axelrod; Frodge; Haston; Love; Majewski; McClintock; Morford; Ross; Silvi)

WBIG- 6955 at 0045. Big Mike's rock music still appears on the pirate bands. Addr: Belfast. (Majewski)

WLIS- 6955 at 0045. Jack Boggan's veteran pirate is continually active, so it's a regular in this column. Programming always consists of interval signal tunes used by international broadcasting stations. Addr: Blue Ridge Summit. (Axelrod; Comeau; Frodge; Hassig; Haston; Jurrens; Silvi; Williams)

WLS- 6955 at 0000. Somebody has been producing a tribute to this Chicago station, using original jingles from when it was a major top 40 rocker back in the 1970's. Addr: None. (Hassig; Haston; Jurrens; McClintock; Silvi; Williams; Wolfish)

WMFQ- 6955 at 2315. This one mixes rock music with chanted IDs by a group of male announcers, both in English and Spanish. It's a parody of the QSL process. Addr: Providence. (Axelrod; Frodge; Haston; Jurrens; Silvi; Wolfish)

WMPR- 6955 at 0130. Their Techno dance music has been on for years, with identifications by a male announcer and the frequency read by a woman. Addr: None. (Artman; Brandt; Espravnik; Hassig; Majewski; McClintock; Williams)

WNOT- 6955 at 0200. The Amazing Mumford's rock and roll has found an effective relay via Dr. Tornado's monster transmitter. Addr: Blue Ridge Summit. (Coughlin; Espravnik; Jurrens)

WREC- 6955 at 0030. P. J. Sparx remains among the most active North American pirates. His distinctive format mixes rock music, comedy, and parody songs to the tune of well known rock music. Addr: Belfast and Blue Ridge Summit. (Kevin Nauta, Grand Rapids, MI; Artman; Axelrod; Brandt; Frodge; Haston; Jurrens; Love; Pearce; Silvi; Williams; Wolfish)

WRFI- 6955 at 2045. This unfortunate call sign occasionally appears on the pirate bands, hopefully without interference. Rock and comedy dominate the latest version. Addr: None. (Haston)

WRKO Shortwave- 6955 at 1400. This pirate rebroadcasts rock oldies music from the licensed WRKO medium wave station in Boston. The station's interview with famous pirates Alan Weiner and Scott Becker was recently heard. Addr: Blue Ridge Summit. (Comeau; Haston; Silvi; Williams; Wolfish)

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Lectrokit SP-1B Spider

Last month we talked about how it was possible to have a lot of hamming fun with simple, inexpensive gear. The SP-1B is a perfect example of simple fun!

The Spider can be purchased in kit form for \$49.95 or fully assembled for \$99.95; either way, it is an excellent transceiver for the QRP enthusiast.

■ The Rig

The Spider transmitter provides about 1.5 watts of RF output on 80, 40, or 30 meters. The rig is crystal-controlled using either FT-243 or HC-17 type crystals (a switch allows switching between two crystals and, of course, since the crystals plug in, they are easy to change). There is a built-in key (of decent quality) and a sidetone generator (to monitor your sending).

The receiver is truly outstanding for a rig of this price! Sensitivity and selectivity are both excellent. An optional two pole audio filter provides superb selectivity and is well worth the extra \$8.95 cost.

The receiver is automatically tuned to the frequency of the transmitter by the frequency controlling crystal; however, an RIT (receiver incremental tuning) control allows the operator to shift frequency a few hundred Hertz. (An optional variable frequency oscillator VFO will be offered soon.) I found the tuning method to be quite satisfactory and superior in many ways to a lot of the VFO rigs on the market.

All you need is a set of headphones or speaker and antenna to put this compact rig on the air.

■ The Kit

I opted to build the kit to see just what went into it and how difficult it was to build. The basic kit does not include a chassis, so unless you have one around I suggest you order one from Lectrokit at a price of \$9.95. There is a deluxe case and panel available for \$19.95, which is what I got.

When the kit arrived I was pleased to see all the components were assembled into stages and bagged individually. Components are all of the highest quality.

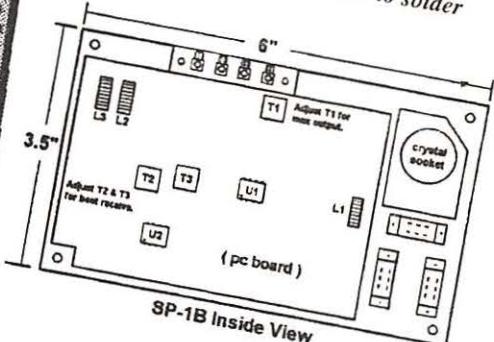
■ Building

This kit is a bit different from many of the kits available today in that the pc board is not marked (i.e., silk screened with the part numbers). Instead, the pcb (pc board) is laid out in



The receiver is truly outstanding for a rig of this price!

I would say this kit can be built successfully by the first time kit builder without help (provided the person knows how to solder properly).



grids (on a drawing) and parts are compared to the drawing (which is very precise and of excellent quality).

I found this method preferable to the pc labeling many kit manufacturers use, as it provides an accurate double-check of every component. Too many pc boards today are poorly labeled, making it difficult to tell exactly which component goes where and how it goes. If you are a first time kit builder this technique may be a bit more difficult to follow initially, but once it is understood you will like it.

I would say this kit can be built successfully by the first time kit builder without help (provided the person knows how to solder properly).

An experienced builder will put this kit together in four or five hours; the novice may require double that time. There are no tricky jobs involved with building the Spider as Lectrokit provides excellent detailed plans and explanations.

The Spider can be built for 80, 40, or 30 meters. I choose 40, as I had a lot of crystals on hand for that band. The manufacturer provides all components to put the unit on the band of your choice.

My kit went together in a single weekend and was on the air that same weekend. Using a 33 foot long Marconi antenna, stations were worked out to about 500 miles with ease. Signal reports ranged from 599 to 339. Coupled to my 40 meter dipole I was able to work several stations in the western USA, including Arizona, Texas, Washington, and Colorado.

Initially I used the Spider without the optional two pole audio filter and found some

difficulty copying stations through the QRM, but upon adding the filter it was a totally different story; QRM was no longer a problem and signals popped right out of the noise. The two pole filter cost \$8.95 and is well worth the price. It can be built and installed in an hour or so.

Crystals for your Spider can be obtained from several sources. If you decide to purchase a kit you might want to write to crystal suppliers at the same time and order several for the band you choose. The two best companies would be Petersen Radio Company at 2735 Avenue A, Council Bluffs, IA 51501; phone 712 323-7539, and CW Crystals 570 N. Buffalo St, Marshfield, MO 65706.

I might also add that, if you choose not to use Lectrokit's case, they provide you with the Radio Shack part number for the preferred metal case.

The Spider is available from Lectrokit, 401 W. Bogart Rd., Sandusky, Ohio 44870; price is \$49.95 (kit) or \$99.95 wired and tested; shipping/handling is an extra \$5. A ten watt model of the Spider is also available for only \$59.00 plus \$5 s/h.

Cases are \$9.95 for the basic unit and \$19.95 for a silk screened case and panel. There is also an antenna tuner kit available at a price of \$37.00 plus \$5 s/h.

Write for their complete catalog and information sheets.

If you are looking for a fun rig, either assembled or in kit form, the Spider deserves your consideration. I like mine a lot and use it almost daily.

Once more we have run out of space; keep the letters and cards coming.

SPECIAL EVENT CALENDAR

October 4 - 26

10-Metre Meteor Scatter Test

Sponsored by the Ontario DX Association. Dates: Saturday, October 4 to Sunday, October 26. Time: 0900-1100 UTC. The ODXA will conduct meteor scatter tests on 10 metres (29.050 MHz) each Saturday and Sunday morning throughout October. Mainly CW. We are seeking signal reports from anyone who hears our signal. We will use standard meteor scatter procedure: 15 seconds transmit followed by 15 seconds receive. We will transmit the first and third 15-second interval each minute. Callsign will be VE3ACK and transmission will be "CQ VE3ACK." We will respond to stations replying to our CQ. Send signal reports to Philip Gebhardt, VA3ACK, P.O. Box 52, Greenbank, ON, L0C 1B0 or to pgebhardt@compuserve.com. For further information or updates on the experiment, visit the ODXA web site at <http://www.grove.net/~odxa/>

October 5

Queens, NY

Hall of Science ARC / PO Box 131, Jamaica, NY 11415; Arnie Schiffman WB2YXB (718)343-0172 (evenings only). Location: NY Hall of Science parking lot - Flushing Meadow Park, 47-01 111th St, free parking; Talk-in 444.200ptr, 146.52simp.9am-3pm, adm \$5.

October 10 - 12

Canadian Int'l DX Club

35th Anniversary convention (new dates!). Contact CIDX Vice-president Mickey Delmage, Edmonton, Alberta 403-450-2231, cidxqsl@freenet.edmonton.ab.ca for more info.

October 12

Lincroft, NJ

NJ State Conv, Shore Area Hamfest / PO Box 635, Eatontown, NJ 07724, Al Jackson NK2O (908) 922-8121. Location: Brookdale Community College, GS Pkwy ex-109, W on Rt 520. Talk-in 145.485/6. Opens 8am (breakfast 7:30). Adm \$6

Bethpage, NY

Long Island Mobile ARC (LIMRC) / Diane Ortiz, K2DO, LIMARC, P.O. Box 392, Levittown, NY 11756, (516)520-9311, LIMARC73@aol.com, www.aol.com/RaySk/LIMARC1.HTML Location: Briarcliffe College, 1055 Stewart Avenue, Bethpage. Talk-in 146.85 (136.5 PL) Admission 8:30am-2pm, \$6.

October 26 - November 2

Contest for European DXers

CORAD: Tropical Country Radio 1997, Memorial Berhnhard Gruendl contest. Research contest to help DXers who are unable to listen regularly at night. For information on listening times and targets, contact Marco CERRUTI, P.O. Box 146, 13100 VERCELLI, ITALY

October 26

Sellersville, PA

RH Hill ARC / Linda Erdman KA3TJZ (215) 679-5764, 2220 Hill Rd, Perkiomenville, PA 18074. Location: newly rebuilt Sellersville Fire House, Rt 152, 5 mi. south of Quakertown, 8 mi north of Montgomeryville. Talk-in 145.31. VE testing 10am-1pm, all classes, bring documents; Admission \$5.

CLUB CIRCUIT

North American Club Listings C - F

Capitol Hill Monitors: Alan Henney, 6912 Prince Georges Ave, Takoma Park, MD 20912-5414, (301) 270-2531/5774 fax. DC, MD, No.VA, So.DE. Scanner bands. Frequency Forum BBS 703-207-9622 (8-N-1) Capitol Hill Monitor. \$10. Meets irregularly.

Central Florida Listeners Group: Mark Kuziv, KC4ZVK, 3217 St. Augustine Ct., Kissimmee, FL 34746 (407) 933-7163, kuziv@magicnet.net. Central Florida; All bands. Net on 146.820 MHz Sun 8 pm. Conference #10 on Laser BBS (407) 647-0031 or Bullwinkle's Corner BBS (407) 896-5772.

Central Indiana Shortwave Club: Steve Hammer, 2517 E. DePauw Road, Indianapolis, IN 46227-4404. Central Indiana; SW broadcasting, pirates, and the offbeat. Shortwave Oddities.

Central VA Radio Enthusiasts: Richard Rowland, POB 34832, Richmond, VA 23234-0832. Metro Richmond and vicinity. VHF/UHF. SASE. No newsletter, no dues. Meets quarterly in Richmond.

Chicago Area DX Club: Edward G. Stroh, 53 Arrowhead Dr., Thornton, IL 60476. 300 mile radius of Chicago; DXing all bands. DX Chicago. \$17, \$1 sample. Meets irregularly.

Club d'ondes courtes du Quebec: Dominique Duplessis, 5120 35 eme rue, Grande-Mere, Quebec, Canada, G9T 3N6; e-mail dduplessis@infoteck.qc.ca; <http://www.infobahnos.com/~pedro>. Annual \$40 Canadian. L'Onde, monthly (French). Sample US\$2.

Chicago Area Radio Monitoring Association (CARMA): Ted & Kim Moran, Box 2681, Glenview, IL 60025, (630) 612-0609 fax. Chicago & midwest. Public safety & general coverage. CARMA BBS (630)852-1292. CARMA Newsletter. Meetings (Sats) and newsletter bi-monthly on alternate months.

Communications Research Group: Scott Miller, 122, Greenbriar Drive, Sun Prairie, WI 53590-1706. Wisconsin area. Scanning.

DecalcoMania: Paul Richards, P.O. Box 126, Lincroft, NJ 07738, (908)591-2522. Worldwide AM, FM and collecting radio related items.

DecalcoMania. \$9 US, \$10 Can/Mex, \$15 Eur, \$16 Asia/Pac. Email: DecalMania@aol.com

Delaware County (PA) Emergency Radio Club: David A. Donohue, 610.493.0292 DDONOHUE@bigfoot.com. Scanning public safety in Delaware, Philadelphia, Buck, and Chester counties. Monthly meetings and online newsletter www.tripod.com/~ddonohue/DCERC.HTM - \$5 dues.

DX Audio Service (National Radio Club): Ken Chatterton, P.O. Box 164, Mannsville, NY 13661-0164, (315) 387-3583; <http://wcoi.com/~gnbc>. Worldwide. North American Broadcasters. DX-Audio Service (90-min.tape). Sample \$3.

Fire Net: Tom Kravitz, Box 1307, Culver City, CA 90232, 310-838-1436, [internet mpage@netcom.com](http://mpage@netcom.com). All of California; fire, EMS, tied in with nationwide notification net.

Fire Notification Network of Michigan: Garry Watts, PO Box 1312, Warren, MI, 48090-1312, (810) 772-4423; firenet@usa.net. Michigan alphanumeric pager net, breaking news via text pager. Customizable Michigan and national options available.

Send announcements or club information to: Editor, Monitoring Times, P.O. Box 98, Brasstown, NC 28902-0098. Fax 704-837-2216, mteditor@grove.net. See www.grove.net/mtclubs.html for listing of North American and international clubs or send an SASE to Clublist, at address above. See ARRL's web site at <http://www.arrl.org/hamfests.html> for full hamfest calendar.

Feed-line Tips and Equipment Protection

Some shortwave enthusiasts I have known have a casual outlook about antennas, feed lines, and protection devices for their station equipment. Their principal focus seems to be centered on erecting a dipole or end-fed wire and hooking a receiver to it. Upon asking a few questions I learned that many of the basic practices for station efficiency and equipment safety were unknown to these SWLs.

This month we will consider some fundamental procedures that might make your listening post more effective while providing protection for your receivers and accessory gear.

■ Old versus New Coaxial Cable

Signal losses occur even in new coaxial cable. The losses in dB (decibels) are proportional to the type of coax, the insulation used within it, the operating frequency and the length of the feed line. It is to your advantage to minimize these losses so that weak signals will travel from your antenna to your receiver with the least reduction in strength.

RG-8 coax is less lossy per 100 feet than RG-58. However, RG-8 is bulkier and more difficult to route into the house. A newer and less lossy coax cable has become more popular than RG-8 in recent years. It is identified as RG-213. If you prefer a modern low-loss 50-ohm coaxial cable that is only slightly larger in diameter than RG-58 (similar in size to RG-59), you may use RG-8X. It is relatively inexpensive and very flexible.

Beware of bargain coaxial cable or cable that is known to be many years old. Coax cable that has been out of doors for several years is usually in poor condition. This results from UV radiation and airborne chemicals contaminating the vinyl outer jacket of the coax and allowing the byproduct to leach into the inner insulation of the cable. This makes it lossy.

Moisture leaking into the cable along the shield braid and outer jacket, over time, will also cause the coax to become contaminated and lossy. You can prevent moisture from entering your coax cable by using a putty-like substance called Coax Seal. Coax connectors that are used out of doors should be sealed with this compound. Likewise at the points where the cables mate with the coax connec-



tors.¹

It is wise to use new coaxial cable, or some of known quality that you may have on hand. When purchasing new coax make sure the outer conductor (shield braid) does not consist of only a few woven strands of copper. The braid should have numerous small copper wires woven into a tight mesh that obscures the inner insulation of the cable when you expose the shield braid. The better the integrity of the braid the more effective its shielding ability.

Losses per 100 feet for each popular type of coaxial cable, versus frequency, are listed in *The ARRL Antenna Book*.² It is important to remember that a 3-dB loss through a given length of coax cable when receiving a signal is equivalent to the transmitter at the other end of the line cutting its power in half. Therefore, the greater the feed-line loss, the weaker will be that DX signal you are trying to copy. Keep the coaxial feed line to your antenna as short as practicable. This is especially important at VHF and UHF, where feed-line losses are always the highest.

■ Can I Bury Coaxial Cable?

It is sometimes desirable to bury the coaxial feed line between the antenna and the

house. The question is frequently asked, "Will it hurt to bury the feed line?" This deserves a "yes" and "no" answer. Never bury ordinary coax, such as RG-58, RG-8, RG-8X, or RG-213 in the soil. Most locations have acid and alkaline components in the ground. These chemicals will quickly contaminate and ruin coaxial cable.

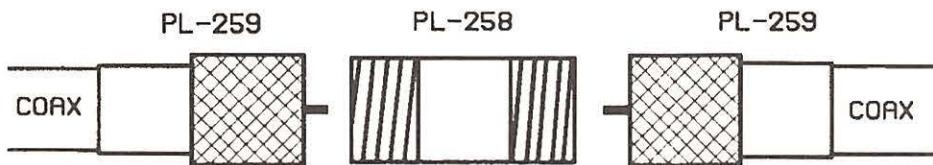
But "yes," there are 50-ohm, RG-8 size cables made especially for in-ground installation. These cables are impregnated with a sticky substance that prevents moisture from entering the cable. Also, the outer jackets are made of tough chemical/moisture-resistant polyethylene material. Designators for these cables are Impervon (Times Wire & Cable Co.), VB-8 (Decibel Products Corp.), and Bury-8. The latter is available from the supplier listed in note 1.

■ Checking for Cable Loss

If you question the quality of your coaxial feed line, especially if it has been out of doors



FIGURE 1 — Examples of lightning arrestors for use in coaxial feed lines. The upper one contains a gas discharge tube (see text).



PROPER COAX SPLICE

FIGURE 2 — Illustration of the correct way to join odd lengths of coaxial cable.

for two or more years, you can use a transmitter, a 50-ohm resistive load, and an RF power meter to make a test. You do not need to have an FCC license to transmit into a dummy antenna.

First, place the RF power meter at the transmitter output jack. Connect the 50-ohm dummy antenna to the far end of the coax to be tested. Connect the remaining end to the power meter. Turn on the transmitter and note the power reading in watts (W1). Next move the power meter to the far end of the coax, just ahead of the dummy antenna. Transmit and note the RF power reading (W2).

Subtract W2 from W1. This will reveal the line loss in watts. Watts may be converted to dB by using $dB = 10 \times \log_{10}(W1/W2)$. Thus, if you have 100 watts at the transmitter end of the coax line, but only 35 watts at the far end of the coax line, the loss is 4.56 dB.

■ Equipment Protection

We must always be mindful of the hazards of lightning with respect to our radio equipment. My practice is to disconnect the antennas and unhook my station equipment from the AC power outlet if a storm is forecast. Also, I use surge protectors between my equipment and the AC outlets. The modem in my computer is protected by a surge suppressor between it and the phone line. I always unplug the phone line from the computer when a storm is expected, just to be sure that no equipment damage occurs. AC line surge suppressors are available in various models at computer supply stores.

Devices are available to protect receivers from lightning energy. Figure 1 shows two lightning arrestors sold by Cushcraft Corp. They are available from Amateur Electronic Supply.³ The upper arrestor contains a fast acting gas discharge tube which protects your equipment from surges up to 5000 amperes. It fires within 100 nanoseconds in the presence of 50 volts or less.

The lower unit is known as a Blitz Bug lightning arrestor. I do not have performance specifications for this model. These arrestors are installed in series with the coaxial feed line. Their cases must be connected to a qual-

ity earth ground. An excellent article that describes the nature of lightning and how it is generated was written by F. O'Driscoll. It appeared on page 8 of June 1997 *MT*.

■ Splicing Coaxial Cable

Sometimes it is necessary to join odd lengths of coaxial cable to provide sufficient feed-line length between the antenna and the station. I have seen examples where the user simply soldered the inner conductors together, wrapped the junction with electrical tape, then soldered the shield braids together and added more tape. Although this may be an acceptable temporary expedient, the opportunity for water to enter the cable is significant. Also, splices of this type weaken the cable. The inner and outer conductors of the cable can easily pull apart in the presence of wind,

or just from the weight of the cable.

The proper way to join sections of coax cable is to use PL-259 male connectors at the ends of the coax where the splice is to be made. A PL-258 female coax union or "barrel" connector is installed between the two PL-259 connectors (figure 2). Coax Seal may then be used to cover and protect the connectors from moisture and corrosion. The three connectors can be purchased for roughly \$2 from the vendor in note 1.

■ Closing Comments

A quality earth ground for lightning protection can be made by driving four 6-foot copper rods in the ground and bonding them together with shield braid from RG-8 coax cable. Ideally, the braid would be soldered to each rod. The four rods should be spaced at least four feet from one another. Additional shield braid may be used from the ground system to the case of your lightning arrestor.

■ Notes

- 1 — The Radio Works, Box 6159, Portsmouth, VA 23703. Phone: 1-800-280-8327 to order.
- 2 — The ARRL, Inc., 225 Main Street, Newington, CT 06111-1494
- 3 — Amateur Electronic Supply, Inc., 5710 W. Good Hope Rd., Milwaukee, WI 53223. Phone: 1-800-558-0411 to order.

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Windshear: The Unseen Enemy

Have you ever wondered just what approach controllers are talking about when they advise pilots that "low-level windshear has been reported on the field"? Let's examine this weather phenomena and why it's so dangerous to aircraft landing and taking off during storms.

Most meteorologists define windshear as "any sudden change in wind speed, wind direction, or both." Windshears are created by air flowing over rough terrain, by warm air currents rising from sun-heated ground, by the collision of air masses of different temperatures and moisture content, and by thunderstorms. Most have no effect on airborne planes. Some, referred to as turbulence, are felt by passengers as bumpiness. So wind shear is a common occurrence.

The National Center for Atmospheric Research, together with other scientists, conducted field experiments and determined that a wind shear called a "microburst" is responsible for aircraft accidents on take-offs and landings. Microbursts are produced when a rainshower or thunderstorm creates a current of rapidly downward moving air — a downdraft — that spreads out horizontally in a starburst pattern when it strikes the ground, just as water from a faucet spreads out when it hits a sink.

Windshear endangers planes for the following reason. Once a plane hits a microburst, it encounters an increase in head winds radiating away from the center of the downdraft. This increase in head winds enhances the airflow over the plane's wings, causing the plane to pitch upward and forcing the pilot to compensate by reducing engine power. Then, as the plane passes through the downdraft center, the head wind rapidly decreases and becomes a tail wind, and the airflow over the wings suddenly falls off, with a corresponding decrease in lift (see illustration).

Any additional loss of airspeed, caused by the pilot reducing engine power and/or the downdraft of air pushing the plane toward the ground, contributes further to this hazardous situation. If the aircraft is too close to the ground when this happens, there may not be enough time for the pilot to react and for the engines to regain sufficient power to compensate for the loss in airspeed. This is the likely sequence of events which led to the crash of Clipper (Pan Am) flight 759 during takeoff

from New Orleans in 1982, as well as the Delta crash during landing at Dallas-Ft. Worth in 1985, and countless other weather-related aviation accidents through the years.

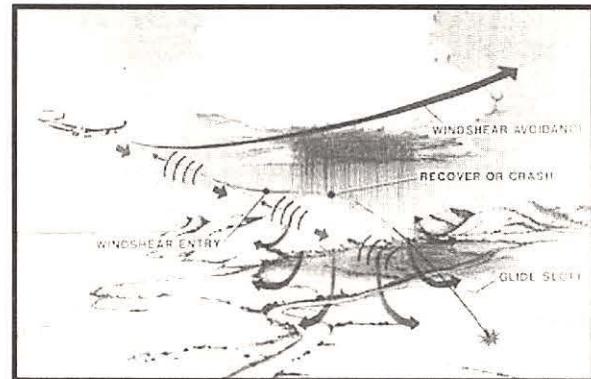
Microbursts are seasonal. They are associated with thunderstorms and rainshowers and occur — but are not limited to — spring and summer, or whenever such storms take place locally. Because precipitation is important in the production of a downdraft, microbursts are always associated with a precipitation cloud. The rain need never actually reach the ground, however. In the dry climates of the western states, rain may evaporate completely before it reaches ground level, yet still produce a strong microburst.

These above ground-level showers are a particular threat to aircraft, because the precipitating cloud looks innocent and the pilot may be caught completely unaware. This is what happened on 31 May 1984 when a United Airlines jet was taking off from Stapleton Airport in Denver. The plane was departing during a seemingly benign shower in which only a few raindrops reached the ground. But, just as the plane was lifting off the runway, it penetrated a microburst and lost about twenty-five miles per hour of airspeed.

The aircraft was only about ten feet off the ground and eleven hundred feet beyond the end of the runway when the fuselage was punctured in three places by an antenna on the ground. The plane then moved out of the microburst and rapidly gained altitude but had to return to the airport because the holes in the fuselage made it impossible to pressurize the cabin.

An almost certain disaster was narrowly averted because the pilot used a recently developed microburst flying procedure that involved pitching the plane up while moving at a low speed. However, this procedure does not mean that pilots can now safely fly through microbursts. If the tail wind had been only slightly stronger, a crash would have been unavoidable.

Analysis of data from field experiments indicates that the average microburst lasts only ten to twenty minutes, that the typical



wind shear immediately following the downdraft hitting the ground is twenty-seven miles per hour, and that windshear increases to fifty-six miles per hour from five to ten minutes after initial impact and then decreases rapidly. Because of the small size and short lifetime of a microburst, existing wind-measuring systems at airports are frequently unable to detect microburst winds in time to warn aircraft.

Low-Level Wind Shear Alert Systems (LLWSAS) have been installed at over 110 major airports across the country and have proven to be of at least some value. Meanwhile, research is continuing to upgrade and improve their usefulness. For example, during the next several years a procedure is expected to evolve that will provide warnings of wind shears and other hazardous weather conditions to most major airports. This system will be based on new Doppler radars and will be capable of estimating wind speeds and direction every 200 to 300 feet within a fifty-mile radius.

Since not all airports are equipped with Doppler radar systems, the FAA mandated that all commercial aircraft must have onboard windshear detection or prediction systems. Airborne sensors may include a microwave radar sensor, a laser system called Doppler LIDAR (light detecting and ranging), and an infrared detector.

The primary task ahead is to develop improved computer models that will rapidly extract wind shear and weather information from radar and other instrument data and communicate it in a concise, informative manner to pilots and controllers as quickly as possible.

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| 1640 | 640-C 0 | 32144 | 300-0 0 | | |
| 144 | 640-C 0 | 32144 | 300-0 0 | | |
| 2600 | 640-C 0 | 32144 | 300-0 0 | | |
| 2640 | 640-C 0 | 32144 | 300-0 0 | | |
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| 2400 | 230-B 100 | 32144 | g 300-0 355 | | |
| 1640 | 640-C 0 | 32144 | 300-0 0 | | |
| 144 | 640-C 0 | 32144 | 300-0 0 | | |
| 2600 | 640-C 0 | 32144 | 30 | | |

"Privatizing" Federal Communications

If Congress has its way, the federal government communications systems will go semi-commercial in the near future. Here is the abbreviated text of Mr. Larry Irving, who is the Assistant Secretary for Communications and Information, National Telecommunications and Information Administration (NTIA), in his testimony before the U.S. Department of Commerce. The hearing was on the Fiscal Year 1998 NTIA appropriations before the Subcommittee on Commerce, Justice, the Judiciary, and Related Agencies on Appropriations, House of Representatives on March 13, 1997.

Spectrum Efficiency:

The Federal Government constantly seeks to modernize its radio communications, decrease the channel bandwidths, and increase its use of new technologies. These are some of the management tools we use....

Federal government users must use commercial services when possible...NTIA requires that every government user requesting a frequency assignment must first determine that their needs cannot be met by a private or commercially available service provider. This policy, contained in NTIA regulations, has resulted in increased use of commercial services by government users. For example, the Department of Defense has increased its use of commercial satellite services, and many agencies are using **Commercial Land Mobile Services** (emphasis mine).

In 1993, the Secretary of Commerce submitted the Land Mobile Spectrum Efficiency Plan to Congress, as required by the NTIA Organization Act. The implementation of this plan resulted in:

1. More use of commercial and government owned trunking systems
2. Doubling the channels in three major federal land mobile bands through new narrow band technology, and
3. The promotion of sharing with the private sector.

Only recently has the private sector adopted a narrow band channel plan.

Thanks to Jim Conrad for finding this and submitting it to the FedCom mailer.

As we have been saying for the past year or so, there is less and less federal activity on federal channels. We have been receiving

sporadic reports of federal agencies showing up on commercial trunking systems. It looks like we might be seeing more of this in the future. I think it will be a while before we find the FBI and the DEA sharing trunking time with the local pizza delivery company or the pool contractor, but if the NTIA has its way, this could be the wave of the future. Start buying those Uniden Trunk-Trackers now before they are all gone.

Reader Input

• We have received our first item of Trunk-Tracker information concerning a federal system. This was on the FedCom mailer and was submitted by Bruce Varine regarding the FBI out in Portland, Oregon. Bruce writes that the local FBI is on the local 800 MHz trunked system and is using talk group 16528. Bruce goes on to say that the U.S. Marshal is also to be found on that system. Bruce has an e-mail address of "WitchDr@usa.net" if you want more information on the system.

I'll bet if we look very closely into our local police and commercial SMR systems, we will find more of the above throughout the country.

• From information on the Scan-L mailer, it seems that Garden City, New Jersey, has the local DEA on its 800 MHz trunked system. They did not provide any talk groups or frequencies. Information please? Garden City uses an old Type 1 system, so apparently the first fleet map in the book will work, but we need specifics.

• One of the contributors to the Scan-L, who wished to remain anonymous, has just finished up working on the DEA radios. He says that apparently DEA has standardized its radio system nationwide on their UHF channels. Here is the current standard plan:

| Channel | Out/Input |
|---------|------------------|
| 01 | 418.625/416.050 |
| 02 | 418.900/416.325 |
| 03 | 418.750--simplex |
| 04 | 418.675--simplex |
| 05 | 418.825/415.600 |
| 06 | 418.950/416.200 |
| 07 | 418.975/417.025 |
| 08 | 418.975--simplex |

This frequency plan is apparently good throughout this hemisphere. Numerous reports have come in from Mexico and South America where 418.625 MHz is the main

channel operating from the DEA headquarters in the American Embassy. The subaudible tone is 156.7 Hz.

• Last month we had several submissions from the Washington, D.C. area. A reader who wishes to remain anonymous did some camping in the Catoctin Mountain National Park. For those of us who did not know, this is where Camp David is located. He stated that interesting conversations have been monitored on not only the Secret Service "Delta" frequency of 169.925 MHz (which is used by the Marine Corps guards), but also on the Park Ranger repeater for the national park. The frequency for this system is 171.725 MHz output with 172.525 MHz input. The subaudible tone is 141.3 MHz.

• Over in Maryland there is some serious monitoring going on. I say this with tongue in cheek because this is the home of the National Security Agency—the home of the "Big Basement." The NSA headquarters are located on the grounds of Ft. Meade Army Post. Ft. Meade has recently gone to a trunked system. Their output frequencies are:

406.325
407.400
407.575
409.450

It seems the National Security Agency has set up its own trunked system. They are using the following output frequencies:

408.150
408.625
409.525
410.275

The only thing monitored is administrative type traffic and the system is a low power one. Do not look for the latest CNN headline story to be broadcast on this system first.

• A mystery frequency of 414.225 MHz has been showing up in the Washington/Baltimore area. It has a subaudible tone of 167.9 Hz with it. This tone is used by the FBI in its radios. The reporter says that it sounds like a Motorola Intrac data system, but it is on the air constantly.

A check of the data base shows that this frequency is assigned throughout the State of Maryland for law enforcement mobiles only. It seems the DEA is also authorized to use this frequency in Washington and identifies it by the callsign "WDL."

It was used up until a couple of years ago by the DEA/ATF Task Force Group 34 which operated from a building on 7th Street SW.

They moved their operations to a Pennsylvania Avenue location in Maryland between the Beltway and the DC line. They also used 419.275 MHz along with the normal DEA frequencies (mentioned elsewhere in this article) for surveillance.

■ Data Delivery on 142.925

There is telemetry being monitored on 142.925 MHz in the Washington area. It is similar to the weather data which is transmitted on 163.35 MHz. Similar data is being heard on 139.650 MHz.

There are two (or more) possible answers for these signals. The first is they could be coming from Silver Springs. FEMA has a disaster network for Region 3 which is based at Olney, with the callsign of KPS303. It is possible they are relaying weather data from the 163.350 net.

The 139.650 MHz signal is used almost nationwide by the Air Force. It carries special energy utility conservation telemetry networks. They use multiple receivers in the system to control electricity to selected sites on the bases. The system at Andrews Air Force Base is rated at 90 watts and the sites at Ft. Myer, Ft. Lee, and Langley are rated at 60 watts. You can monitor the civilian equivalent on the frequency of 154.45625 MHz.

■ FCC Rides in Style

One of our faithful monitors, Ken Wyatt, of Colorado, sent in a submission to the Fedcom mailer regarding the FCC monitoring vehicles in use. He had seen the latest vehicles in use out of the Denver Field Office and passed along the following information.

The vehicles are late model Ford Explorers with heavily tinted windows. The entire cargo area in the rear of the vehicle is full of equipment.

A two foot diameter hole is cut out of the center of the roof. There a fiberglass antenna which is vertically polarized but horizontal in structure is installed. It consists of 36 radials. It is then covered in another layer of fiberglass which is flush with the remaining metal roof. The entire works is then body-putted around the edge and the roof is repainted to match the body color.

The external antennas include a disguise broadcast, which covers the VHF communications, the DF antenna built into the roof (mentioned above), a GPS receive antenna also built into the roof, two cellphone antennas, and a UHF look-alike scanner receive antenna. The communications on the vehicle include VHF on 167.050 MHz and encrypted cellphone capability.

The receivers on board include a programmable AOR 3000 scanner and a Watkins-Johnson

"black-box" receiver. This is an interesting shortwave receiver. It is essentially a black box. It is completely computer-controlled and has no external knobs. Price is in the 30,000 dollar range. There is a remote controlled spectrum analyzer and a couple of PC computers with touchscreens which have a console mounted display. They run the receivers and the spectrum analyzer. There is also a multi-mode television receiver on each vehicle.

Each mobile unit includes a separate hard drive on one of the computers with the entire map of the United States linked to their GPS system. The GPS is controlled by one PC and the Watkins-Johnson receiver and spectrum analyzer is controlled by the other PC. Everything is recorded on 1/2 inch video tape on a VHS recorder in data format for replaying back at the office.

A source tells me that there are twelve to fifteen of these vehicles located throughout the United States, with the majority being in major monitoring locations. They had been using large, late model sedans with dark windows, but it seems they needed more space for the additional equipment and vans draw attention—so they went to the Explorers.

■ Customary Frequencies

I keep getting mail that Customs has a new frequency of 165.235 MHz. This is not correct. Some of the scanners will not allow the fourth decimal place to be entered. The actual frequency was, and still is, 165.2375 MHz.

While we are discussing Customs, it seems they have gotten sneaky on us and are using the frequency of 163.250 MHz for simplex surveillance operations in some areas. The frequency of 163.250 is a *nationwide* hospital paging frequency. Customs is using it in some areas

where they will not bother hospital paging by their operations.

This brings up another point. With all of the two-way radios out there now either being "dial up the frequency" or PC synthesized, a lot of law enforcement agencies—local, state, and federal—have discovered the paging channels. It appears the nationwide paging channels are being programmed into their two-way radios. They use these channels for low power tactical operations. If they can find an unused channel in their area, they have a new frequency to use. I don't know how it is in your area, but the 454 MHz band has a lot of unused frequencies in it here in South Florida. Might be a good place to look.

A New York City source, who has proven reliable in the past, sent me the following:

New York City Customs Band Plan

| Channel | Output | Input |
|---------|----------|----------|
| 01 | 165.2375 | Simplex |
| 02 | 165.2375 | 166.4375 |
| 03 | 166.4625 | Simplex |
| 04 | 165.4875 | 166.5625 |
| 05 | 165.4875 | Simplex |
| 06 | 166.1250 | Simplex |
| 07 | 165.4625 | 166.5875 |
| 08 | 165.4625 | Simplex |

There is some traffic noted on 169.450 MHz, but the signal is weak in his area of New York City.

■ New E-Mail address

I have a new e-mail address. You may reach me at JOHNF0413@AOL.COM. (That is a number zero after the JOHN, not a letter o.) Let's see some Federal trunking information coming in. See you online.

Motron 310 Garfield St Suite 4
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<http://www.motron.com>

New DTMF Decoder

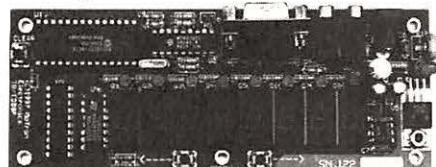
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Satellite Radio For Your Car

If you ask many Americans, they might say the right to drive a car is covered in the first ten amendments to the *U. S. Constitution*. Hundreds of millions of vehicles cram our highways every day. Millions more lie in tens of thousands of rusting auto graveyards, and still millions more are rolling out of Detroit and steaming over from across the seas. One of the few things that can top our consumption of cars might be our consumption of radios.

Happily, nearly every car in this country has a radio of some sort in it and most have cassette tape players. In a move to add even more entertainment to our driving, built-in CD players are now standard equipment on luxury models with add-ons widely available at decreasing prices. Is there no end to our need to be distracted from the road?

Maybe... The final word on in-car audio entertainment is just about to dawn and its debut may be even more auspicious than that of small dish satellite TV.

The FCC calls it the Digital Audio Radio Service (DARS), but you'll call it satellite radio—the best thing you've ever heard in your car. Last April the FCC awarded the only two licenses it will issue for the service to CD Radio, Inc. and American Mobile Radio Corp. (AMRC). The two bought the rights to use this part of the spectrum by plunking down \$83 million and \$89 million respectively. Industry sources believe this to be a very cheap price for an industry which figures to gross over a billion dollars per year just a few short years after launch.

Satellite Radio History

The deadline for applying for FCC approval for the DARS was in 1992. Surprisingly, only four companies came forward. However, it took five years to award the licenses due to wrangling among FCC commissioners and a steady stream of objections from the terrestrial radio broadcast industry headed by the National Association of Broadcasters. The number of licenses was limited to two, because the band they'll be operating in

(2.3 GHz S-band) is very narrow and will only support two competitors. The two highest bids, CD Radio and AMRC, won.

Neither company was exactly dozing in the five year interim that it took the FCC to get in gear. Both are building satellites and developing production models of their respective receiving equipment. The interesting thing about the receivers is that the FCC has required they be compatible with each other (doubtless remembering the Beta vs. VHS contest) so that customers may switch between services without having to buy new receivers. My guess is that the services will be

as 200 miles from U.S. coasts. Customers include shipping companies which deal with maritime, air, and land transportation.

AMSC provides seamless communications between satellite and land based transmission modes. They will fly two satellites in the 2.3 GHz band for their DARS at 85 degrees and 110 degrees west.

CD Radio has pioneered many of the technical aspects of digital radio and has brought some innovative technology to the service. Their novel 2" diameter flat antenna sends the down-converted satellite signal to the in-dash receiver via a miniature transmitter operating

at 900 MHz. Since the programming is sent via a highspeed data stream there's no loss in the extra transmission hop.

CD Radio will fly its two S-band birds at 80 degrees and 110 degrees west.

Programming

Both DARS providers plan to use similar digital compression technology to deliver the CD quality audio that makes this service so appealing. While AMRC has yet to release its programming plans, CD Radio says it will offer 50 channels of audio programming. 30 channels will be formatted music similar to that currently found on terrestrial audio satellite broadcasters

DMX and Music Choice (see chart). In addition, CD radio plans to have 20 channels of sports, news, and talk-show formats. Industry sources say that these additional 20 channels may be advertising supported.

CD Radio won't rely on other established networks or services to provide their programming. They plan to initiate all of their programming including the talk channels. CD Radio Chairman and CEO David Margolese says "...We plan to ...construct our national broadcast studio, a superstudio housing 50 radio stations under one roof, in the talent-rich environment of New York..." He sees his satellite radio delivered programming source becoming as pervasive in radio as cable is to television.

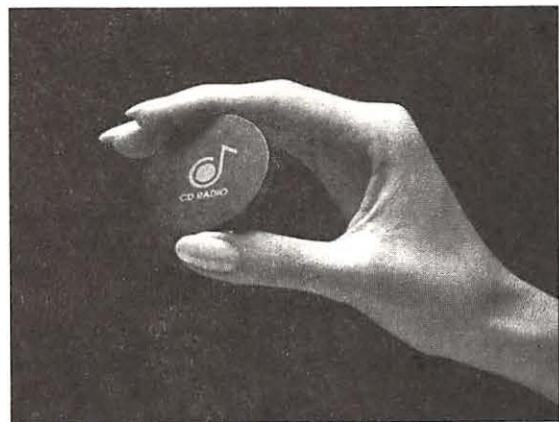


CD Radio plans to change the way you hear music in your car. Not only will you get great CD quality music, but the selection currently playing will be displayed on an digital read-out screen. The receiver will cost an estimated \$150 more to include the satellite band. (Courtesy CD Radio, Inc.)

nearly identical *a la* DirecTV and DISH, and that the only differences may be in billing schemes.

The Players

Both companies have a claim to promote. AMRC is a division of American Mobile Satellite Corp. (AMSC), a company which provides satellite delivered data, voice, and paging services to the transportation industry. AMRC has been operating its L-band Hughes-built satellite, in geosynchronous orbit at 101 degrees west, since its launch two or more years ago. It provides voice, high speed data, and facsimile services to customers all over the U.S., including Puerto Rico, and out as far



Don't throw that little plastic chip away! That's your satellite antenna, downconverter, and 900 MHz wireless relay to your in-dash satellite receiver.
(Courtesy CD Radio, Inc.)

While AMRC hasn't announced details of their receiving equipment or subscription plans, CD Radio plans to offer their services on a subscription basis for around \$10 per month. They expect to sell most of their units in rural areas where radio programming is more sparse.

■ Money in the Bank

Any way you slice it, the numbers appear to be there. By the turn of the century, industry sources predict there could be as many as 100 million DARS units in service. That would make it a \$1 billion per month industry, far outstripping the success of the DBS satellite service, which after three years has only 7 million subscribers.

But, before you get a second mortgage for your house in order to cash in on this latest electronic bonanza, you should know there are a few possible pitfalls. Not the least of these is that the satellite may never get off the ground. There is always a chance of a failure at launch. Once launched, there's no guarantee the satellite will prove operational. More than one satellite has failed to achieve geosynchronous orbit for reasons still not understood. Once in orbit and operational, there's still the chance of a Telstar 401 type catastrophe in which the bird stops operating and ground controllers can only speculate on the cause.

Add to these scenarios the possible technical problems which might make listening to this service more than annoying. These proposed satellites put out a whopping signal, which partly explains why a 2" antenna will work. But, satellite signals still rely on "line-of-sight" reception. You must literally be able to see the satellite—no obstructions in the way—in order for the signal to reach the

antenna. Given the physics of planetary structure, the further north on the planet you travel the lower the look angle and the more chance there will be something interfering with your signal.

What about that big truck next to you on the Interstate, what about traveling through mountainous states or in built-up suburban areas? Center-city urban areas? Tree shrouded country roads? What about rain-fade and snow cover? What will happen to the in-dash satellite receiver the first time you key up your 100 watt SSB ham transceiver?

We imagine that these questions will be fully addressed by the time receivers get on the market. DBS

satellite TV had a number of problems when it first burst upon the scene and has managed to overcome them.

■ Final Four Wheel Frontier

Driving and listening to the radio are two things virtually every American enjoys. Radios started appearing in cars shortly after mass production made the automobile an object of middle class desire. AM was joined in

SAMPLE OF CD RADIO'S AUDIO LINE-UP

30 of CD Radio's 50 channels will feature audio formats in these self-explanatory niches.

1. Symphonic
2. Chamber Music
3. Opera
4. Today's Country
5. Traditional Country
6. Contemporary Jazz
7. Classic Jazz
8. Blues
9. Big Band/Swing
10. Top of the Charts
11. Classic Rock
12. 50's Oldies
13. 60's Oldies
14. Folk Rock
15. Latin Ballads
16. Latin Rhythms
17. Reggae
18. Hip-Hop & Rap
19. Dance
20. Songs of Love
21. Singers + Strings
22. Beautiful Instrumentals
23. Heavy Metal
24. Album Rock
25. Alternative Rock
26. New Age
27. Broadway's Best
28. Gospel
29. Children's Entertainment
30. World Beat

the late 60's by FM and in the 80's by cassettes, with just a brief fling with the 8 track cartridge tape in between.

Now, even before CD players become standard equipment, satellite delivered audio with 50 channels is fast approaching. Most of us never even had the chance to enjoy mobile shortwave radio. Maybe AMRC or CD radio will consider adding the BBC or at least devoting one channel to a replay of World Radio Network's line-up. That would be nice.

For more information on AMRC and CD Radio check out their websites at <http://www.skycell.com> (AMRC) and <http://www.cdradio.com> (CD Radio). Information on these sites is fairly sparse, especially AMRC, where you wouldn't know they're even involved in the DARS business. Keep checking these sites as time goes by; they may yet gradually evolve into something. Or, you may write them at American Mobile Satellite Corp. 10802 Parkridge Blvd., Reston, VA 20191-5416 and C.D. Radio, Inc., 1001 22nd Street NW, Washington, D.C. 20037.

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WiNRADiO SMT Device Primer

This is the first of a series of performance and feature upgrades for the WiNRADiO wide-spectrum communications receiver. Last month's column offered detailed instructions to safely and completely disassemble the WiNRADiO receiver. Please save that column for posterity! This month continues the series with a little warmer-upper enhancement that's within the capabilities of most hobbyists. It's easy and shouldn't take much time, but it will bolster your confidence to dig into WiNRADiO for the heavier stuff that comes later.

■ Reducing Crossover Distortion

This sweet and easy hack reduces "crossover distortion" in the output of U6d, the audio preamplifier for the power amp, U9. The procedure is a piece of cake: refer to Figures 1-2 and the following steps:

1. Disassemble WiNRADiO per instructions given last month (Sept 97).
2. On the normally unseen (back or bottom) side of the smaller WiNRADiO daughterboard, locate the unused spots for D24(2). Use Figure 1 as a guide.
3. Solder a 1.2-k SMT resistor (size 1206) to the empty spots for D24(2). (See Table 1) A tiny 1/8-watt or 1/10-watt leaded resistor will work if the leads are bent tightly around and clipped to mate with the pads for D24(2). That's all there is to this one, folks!

FIG-1: DAUGHTERBOARD (BOTTOM)

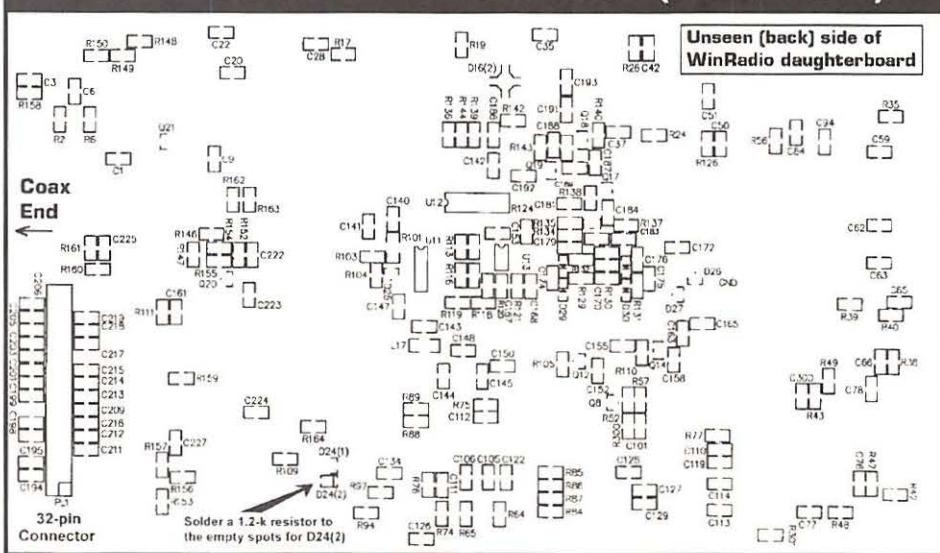
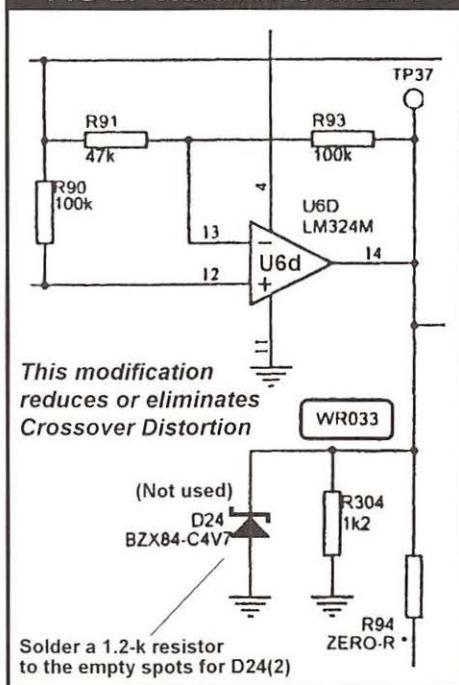


FIG-2: WINRADIO MOD-1



■ The Technical Stuff

See Figure 2 where we put a 1.2-k resistor in parallel with the existing 1.2-k R304. This drops the load impedance for U6d to about 600 ohms—probably a better impedance match for the programmable volume control.

U8, (not shown), that lies between U6d and U9. Conveniently, the pads of D24(2) are unused; and are a prime location for the new 1.2-k resistor.

By the way, even though it's fairly obvious, the value shown in the schematic as "1k2" is how the more familiar "1.2-k" is expressed in many other countries. Makes sense, if you think about it. You'll run into subtle differences like this, the more you explore WiNRADiO, so don't panic or freak out.

■ Parts Required For Other Mods

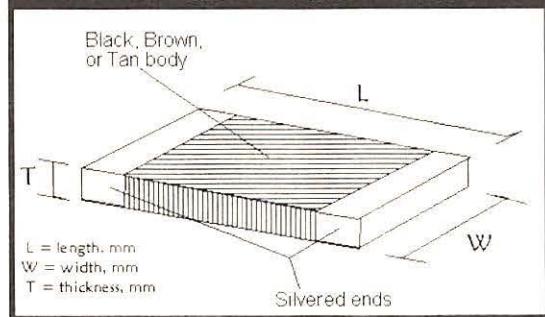
If you'd like to get prepared with all required parts for this and the next three WiNRADiO mods, Table 1 offers a list of what you'll need:

TABLE 1: WINRADIO MODS PARTS LIST

| MOD | # ITEM | VALUE | TYPE/SPECS |
|-----|-----------|-------------------|--|
| 1 | Resistor | 1.2-k ohm | SMT 1206 5% |
| 2 | Capacitor | 0.1- μ F | SMT 0805 X7R |
| 2 | Resistor | 12-k ohm | SMT 0805 5% |
| 2 | PIN Diode | VHF/UHF switch | MMBV3700-LT1 or HSMP-3830 or 1SS314 or MMBV3401-LT1 |
| 2 | Wire, ins | 4" | 22-24 ga solid |
| 3 | Capacitor | 100-pF | SMT 0805 X7R |
| 3 | Capacitor | 100-pF | SMT 0805 X7R |
| 3 | Capacitor | 0.1- μ F | SMT 0805 X7R |
| 3 | Capacitor | 0.1- μ F | SMT 0805 X7R |
| 3 | Resistor | 18-k ohm | SMT 0805 5% |
| 3 | Resistor | 18-k ohm | SMT 0805 5% |
| 3 | Resistor | 12-k ohm | SMT 0805 5% |
| 4 | IF Filter | CFW4551 | Ceramic IF filter |

I am making up kits of the above parts for those who don't want to sweat the minimum orders required by some vendors, as well as those who aren't all that accomplished on the SMT parts scene yet. to ensure that all the exact parts are handy. All 12 parts and the 4-inch wire come in a packaged "kit" for six bucks, plus a buck for shipping and handling. Make it US\$7.00, ppd/domestic (US\$10.00 ppd, surface, for all foreign). Allow more for airmail. Order my part no. WRKit1-4.

You can, however, get most everything you need from DigiKey (800) 344-4539; Mouser (800) 346-6873; and/or Future-Active (800) 655-0006. The ceramic IF filter

FIG-3: SMT RESISTORS & CAPACITORS

might be a problem, but I am working on finding independent sources of those for you, as well.

■ Basic SMT Device Primer

WiNRADiO consists of about 97.3% surface mount technology (SMT) components. Even though it is possible to use "normal" leaded components with most of our modifications, you can literally paint yourself into a corner with that kind of shortsighted shortcut. It's not possible to give you the big picture in this limited space, but heed my caution that "normal" components could be so large as to complicate or prevent other modifications. Please use SMT components whenever specified.

.08" L x .05" W. The 1206 type is about .12" L x .06" W. The 0805 and 1206 are more common to the hobbyist, but 0603 and 0402 are often seen in manufacturing. 0402 types are just specks and are easily blown away by heavy panting or even blinking. (May your chosen deity help you if you sneeze in the same room as a pile of 0402 parts!) When you have a choice, stick to the larger types if you know what's good for you. There is no functional difference among the sizes other than wattage ratings for resistors and voltage ratings for capacitors.

■ More About SMT Devices

Working with SMT stuff by hand is usually an afterthought of R & D and/or Prototyping on the industrial scene. Self-respecting consumers aren't about to mess with the innards of modern electronic apparatus. So; it's not easy to learn hobby-grade SMT except by trial and error....and a rare article like this one. Here are a few tips and kinks that I've picked up along the way.

Tools For SMT Work: Use medical tweezers for handling SMT devices. Tweezers

have a limited-force grip that won't damage the part like other tools can do. The angled tweezer tips permit maneuvering the part without your hand blocking the view. Angled tweezers afford a clean release that is less likely to dislodge the "speck" after you've painstakingly placed it.

Normal soldering tools for electronics are fine for hobbyist SMT work, but the critical thing is a slender, pointed tip on the soldering pencil. Don't use conventional copper tips, either! Instead, use the silver-colored "iron clad" tips. These tips transfer heat somewhat better than copper, and they don't corrode as readily. Heat range of the soldering pencil isn't critical, but 12-30 watts is fine; 50-watts, if you're good at this work.

Salvaging SMT Parts: Don't be pennywise and pound-foolish, salvaging SMT resistors and capacitors. SMT devices can be damaged by excess heat from repeated soldering actions, so even though you manage to salvage a part, you have no assurance that it is any good.

Once they're soldered, to remove them it's best to wick excess solder from the pads; crush the part with a pair of diagonal cutting

pliers, and then desolder the broken ends. Transistors, diodes and IC's can be salvaged with greater chances of success because of their tabbed leads.

Installing SMT Parts: To install an SMT device, it is wise to take time and pain to ensure that it is properly and accurately positioned on the pads before soldering it. Once it is in position, hold it down in place with the tip of the tweezers pressing on the body of the device. Apply straight-down pressure because angled force will invariably cause the part to slip six feet just as you apply heat and solder. Some guys like to apply a tiny dot of rubber cement to the bottom of an SMT device before putting it in place. I suppose this can minimize slippage, but it takes more time and can be messy if you're not careful. Don't solder an SMT device until you are certain that it has been properly positioned and won't move during the process.

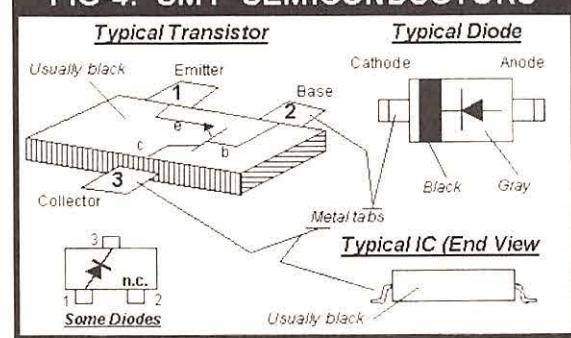
Soldering SMT Parts: Apply a bit of solder to the freshly wiped, fine-pointed tip of your soldering pencil. Press down on the SMT part as described above, and touch the soldering tip to one pin, tab, or end conductor of the device.

Within a second or two, enough solder should flow from the tip to the pad and the device to at least hold it for the time being. Now, holding solder in one hand and the soldering iron in the other, apply a tiny dollop of solder to the other end of the device or to another pin or tab. Let enough solder flow to do this connection right the first time. Then, go back and touch up the first solder joint so that it is "right."

■ More Information

The latest information and software updates for WiNRADiO are available at their US Web site at <http://www.wnradio.com> and at the Australia site: <http://www.wnradio.net.au> If you don't have a WiNRADiO, you can still download the latest software and run it in demo mode. I freely provide tech support on the WiNRADiO mods and all my articles by e-mail or (heaven forbid) postal mail that includes an SASE. Fax inquiries are fine, but please include your e-mail or postal address if you need a reply.

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 FTP: <ftp://ftp.cts.com/pub/bcheek> or <ftp://204.210.20.47>
 FAX: (619) 578-9247 anytime
 Postal: PO Box 262478; San Diego, CA 92196-2478

FIG-4: SMT SEMICONDUCTORS

Figures 3 and 4 graphically depict the appearance and shapes of many SMT devices. Table 2 identifies the common sizes and dimensions of SMT resistors and capacitors:

TABLE 2: SMT DEVICE TYPES/ SIZES

| Type/Size | Length | Width | Resistor Thick | Watts |
|-----------|--------|---------|----------------|-------|
| 0402 | 1.0 mm | 0.50 mm | 0.35 mm | 1/16 |
| 0603 | 1.6 mm | 0.80 mm | 0.45 mm | 1/16 |
| 0805 | 2.0 mm | 1.25 mm | 0.60 mm | 1/10 |
| 1206 | 3.2 mm | 1.60 mm | 0.60 mm | 1/8 |

Even though the dimensions of the above SMT types are given in millimeters (for accuracy), the Type/Size numbers actually relate to inches. For example, the 0805 type is about

Just The Way Life Is

Well, here we are with the summer of '97 just a memory and the winter holidays fast approaching. I feel cold just thinking about it. We have a mixed bag of topics to cover together so let's get right into them.

■ More Radiorafting

Following our look at the decoding program *Radioraft* in August, Barry Stone sent an e-mail detailing his observations using this program with his Racal RA17. (Hm-m-m, I think I know that company!) He compared Radioraft to his PK-2323 (think he meant a PK-232) and "... found that the mode recognition (of Radioraft) is quicker and more reliable than the PK, plus of course it decodes a lot more modes."

Barry has tried Radioraft with a whole host of interfaces, including a homemade interface from the Unofficial Hamcomm Internet site using a TL071 amp, Tigertronics BP2M, a BATG ST5 and a commercial Redifon data modem. He reports that they all worked about the same and suggests the homemade, very low cost interface.

I have done some more work with Radioraft and found it to be excellent for decoding signals in the clear. If my R71 can separate them, Radioraft can decode them. Clearly, this could be enhanced by an active filter stage, or automatic gain control stage in the hardware interface. As Barry points out, and I have also observed, the simple interface works great most of the time. Problems only occur when it "hears" more than one signal and at very low signal levels. But overall, considering its cost, Radioraft with the simple interface does a great decoding job. Thanks for your input, Barry.

■ SWRL v2.0 is Here!



Back in February we looked at a very nice SWL logging program called SW Radio Log (SWRL) from DXtreme Software. Version 1.0 had lots of excellent features and was a real bargain at around \$25. Bob Raymond, President of DXtreme, sent the new version, 2.0. It has added additional features to an already fine-tuned program.

Additions in version 2.0 fall into two categories: database searches and report writing. The program's Script Editor now allows you to create and edit files for QSL reporting. The user can create a number of reception forms, or templates, for different uses. This includes different language reports as well as different physical layouts and information content. They are very easy to create and use.

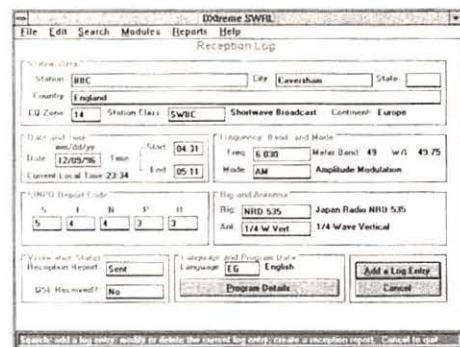
Version 2.0's station search engine now allows its user to call up previous receptions by station country, in addition to its name and reception date. The search also seems quicker.

Dictionaries of common French, Portuguese and Spanish words are included to help in QSL requests. And SWRL v2.0 now supports Word 97 for all you people who bought Bill Gates' latest wordprocessor.

When you want to send out these professionally prepared reception reports, DXtreme makes it just as simple. For example, sending reception reports via e-mail to NASWA is now a simple mouse click operation.

If you bought a previous version of SWRL and live in North America, the total cost of the upgrade is only \$5, and that includes shipping! In my opinion, it's \$5 well spent. Elsewhere it costs \$7 USD. If you don't already own an older version, to upgrade to version 2.0 is \$26.95 in North America; \$28.95 anywhere else. Download the demo version of

SWRL v2.0 from their Web site at <http://www.qth.com/extreme>. Their snail mail address is 26 Langholm Drive, Nashua, New Hampshire 03062.



■ We get letters ... Boy! Do we!

It's been a number of years since I proposed the concept for Computers and Radio column to Rachel Baughn, the very fine chief editor of *Monitoring Times*. Since the very early days of the column I have received many, many letters from our readers. Some ask for assistance. Others relate your experiences with products. And still others have told me how much they enjoyed, or didn't enjoy, the column. Most of the letters — and more recently, e-mails — have fallen into these categories. That is, until now.

When I conceived of the column in 1990, I already had many years of industrial experience and had seen the critical role that computers played in military communications. But in 1990, computers were just starting to impact the professional and consumer communications world. I knew the effect on all of us would be dramatic. I had seen this technology-shift phenomena many times before in my industrial electronics career.

In the 1930's, 40's, 50's, and 60's, electronics was synonymous with vacuum tubes (valves as they are called in the United Kingdom). Every electronic circuit used them. No one could conceive of an electronics world without vacuum tubes. They were the main section of every electronics catalog. Local television repair shops stocked hundreds, even thousands of tubes. I know this firsthand since

```

SWRL v2.0 - Reception Log - File Edit Search Modules Reports Help
Reception Log
Station: BBC Date: Caversham State: 
Country: England
EQ Zone: 14 Station Class: SWBC Shortwave Broadcast Continent: Europe
Date and time: 1997/08/20 04:21
Freq: 6.030 Modes: 49 W/ 49.75
Time: 05:11
Mode: AM
Current Local Time: 23:34
Freq and Band: 5.935 Meters Band: 49 W/ 49.75
Modulation: Amplitude Modulation
Freq and Antenna: 5.935 Japan Radio NHK 5.95
Ant: 1/4 Wave Vertical
Program Details: Program Details
Add a Log Entry: Add a Log Entry
Cancel: Cancel

```

my Dad was in the TV and stereo repair business, among many other businesses, and his home-repair trucks each carried over 200 tubes. By the 1970's the venerable tube was being pushed into extinction by the transistor.

Then one day in the late 1970's they disappeared! The vacuum tube, which reigned supreme for over forty years, was gone. No fade out. They, and an era, were gone, probably forever. It happens just that way in all facets of life, not just technology. Perhaps it's because we humans are so self-centered that we think that life will stay forever just the way it is today. I guess we didn't pay attention in our history classes and missed how many hundreds of generations before us saw their world change just as suddenly. What appeared as stable, non-changing ways of life were in reality just lulls in mankind's development.

Today, radio communications, along with all personal communications methods, are going through great changes. Gone are the days, filled with romance and excitement, of communicating on 20 meters with someone on the other side of the world; the thrill of riding the electronic waves on the ionosphere. Now we just pick up the phone and dial. No chance happenings, sun spot considerations, MUF or uncertainties here. Just 55 cents a minute.

Remember the uniqueness and special feeling that went along with using wireless radio communications? SWLers, hams, and CBers know exactly what I'm talking about. It was almost like belonging to an elite club, the "My Voice is Sent Over Radio Waves" club. Our friends and family were in awe.

Well, now our mothers have more on-air time and hold more DX QSOs than we ever did. How? Via their cellular phones. Yes, they are the common person's walkie-talkies of the 1990's. Ten years ago could you imagine a walkie-talkie that would allow you to communicate with people around the world? No? Well, think of what the now common cellular phone and the cell site infrastructure represents to the common person.

So, should we be surprised that the man-in-the-street has lost their awe of shortwave communications? Just as we are no longer in awe of fire, as were our pre-historic ancestors. Add the World Wide Web to everyone's life and they have instant access to almost anyone, anywhere! Mankind's technology is evolving, as it has since the beginning of time.

Get The Culprit!

Who is to blame for the radical changes we are seeing in communications today? Well, according to the latest letter I received, the instigator of all this is none other than yours

truly, MEeeee!

The letter goes on to say that by introducing the computer to radio users I "planted the seeds of radio's destruction ... and continue to do so with your discussion of the evil internet." The letter goes on for four handwritten pages relating how I have "encouraged," "fostered," and "led" the communications users to their final chapter. The letter ends with a solemn warning, "Go ahead. Keep pushing the internet and computers and radio will be finished."

I beg to remind this person, and all of us, that due to the rural nature of my community (which I like just that way) I didn't have Internet access until mid 1996. Also, I suggested in a previous column that the uncertainty and skills which made DXing shortwave an art and so enjoyable would never be duplicated by the Internet. Been There, Done It, Got The T-Shirt.

However, as I said above, in 1920 the technologists of the day could not conceive of a world without spark-gap transmissions. Less than fifteen years later they were gone. Perhaps the final curtain is now coming down on analog voice/picture modulated SSB, AM, and FM signals with the advent of digital communications.

Two quotes from well-known writers of the 20th century come to mind. The first, from Marshal McLuhan, a philosopher of the 1960's, observed that "The media IS the message." How we communicate is as important as what we communicate. I don't think he was pondering what we are faced with in communications today. However, I'm sure all of us SWL Dxers would agree with him. And finally, the famous jet pilot turned writer, Richard Bach, reflects in his novel *Illusions*, "What the caterpillar calls the end of his world, the butterfly calls its beginning."

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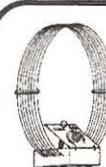
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THE
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ON
GLOBAL COMMUNICATIONS

Yes, we have seen dramatic change in radio communications in the past year or two. These have left us all very disoriented and navigating in a totally new territory. I am as bewildered as anyone at the speed of change. And, at least initially, a bit disappointed at all the changes.

But, as I have seen with the passing of the vacuum tube, discrete transistors, AM on shortwave, the slide rule, manually tuned radios, and paper logs, the future is uncertain but not necessarily to be feared. Remembering and learning from the past, while embracing and attempting to understand the opportunities of the future, has brought us from the spark-gap to where we find ourselves today ... And to wherever we will be tomorrow. The journey continues.



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Standing on Protocol

Welcome to *Digital Digest*. In this column we'll focus on some of the basics of digital monitoring, the facilities that use these modes, and a brief description of the major digital protocols employed on the HF and VHF bands today.

To many of you, I'm sure, the word "digital" brings to mind Baudot radioteletype (RTTY), one of the oldest codes still in use today. Once the mainstay of the digital shortwave modes, RTTY now comprises only about 50 percent of the decodable signals out there in the airwaves.

By way of introduction, we'll examine which stations/facilities use these modes, as well as identify their major message types. A very brief introduction to currently used digital modes then follows. Formerly limited to the shortwave (HF) spectrum, the VHF/UHF bands now present new opportunities for the digital monitor.

Utility stations generally operate within one of three broad classifications:

- * Aeronautical
- * Maritime
- * Point-to-Point

and may be designated as either fixed or mobile with respect to location. Unlike the international shortwave broadcasters, utility station traffic is intended only for the parties involved, and is therefore confidential in nature (i.e., may not be repeated or used to another's benefit).

Utility stations use a variety of modulation types. These include the "3 R's":

- * Radiotelephony (Voice - ISB/SSB)
- * Radiotelegraphy (Morse Code/CW)
- * Radioteletype (RTTY/other Digital Modes)

Traffic currently being monitored by digital hobbyists includes the following:

Aeronautical

- Aeronautical Fixed Telecommunications Network (AFTN)
- Aeronautical Actual and Forecast Weather
- Terminal Area Forecasts (TAF)
- Aircraft Flight Plans and Arrival/Departure Messages
- Notices To Airmen (NOTAMS)
- ACARS (Air/Ground Aviation Messages and Aircraft Telemetry)

Maritime

- Inland Stations
- Great Lakes & Inland Waterways Weather and Traffic
- Coastal Stations

- Weather Synopsis, Reports, Watches and Warnings
- Iceberg Alerts (North Atlantic)
- HYDROLANT/HYDROFAC Broadcasts
- NAVTEXT and NAVAREA Broadcasts
- Telex Traffic to Individual Vessels
- News, Sports & Financial Reports

- Astronomical Observatories

International Relief Agencies

- United Nations Agencies
- International Red Cross/Red Crescent Society

Point-to-Point Circuits

- International Banks and Financial Agencies
- International Business Corporations
- Pager Communications

HF Digital Modes (Shortwave Bands)

| | |
|------------|--|
| ARQ-E | Newer mode, mostly used by French military, stations may idle for hours. |
| ARQ-E3 | Newer mode, mostly used by French military, stations may idle for hours. |
| ARQ-M2/4 | Older mode, used by all three categories of utility stations. |
| ARQ-N | Newer mode, single channel ARQ, very few frequencies identified to-date. |
| ARQ-S | Newer mode, very few frequencies/stations found to-date. |
| ARQ6-90/98 | Newer modes, used by French and Italian Embassies. |
| ASCII | Little commercial usage — some experimental use (amateur radio). |
| AUTOSPEC | Limited to a small number of British maritime stations. |
| CIS | Synchronous teleprinter system using 11/14/27 bits (former Soviet Union). |
| CLOVER II | Sophisticated amateur radio protocol. Most reliable digital ham mode. |
| COQUELET | Similar to PICCOLO, used by Belgian and French military/police. |
| CW | Being phased out for maritime usage — still heavily used by hams. |
| DUP-ARQ | Newer mode, used only by Hungarian embassies. |
| FAX | Transmission of weather charts and maps, press and satellite photos by international press, military, maritime, and meteorological stations. |
| FEC-A | Newer mode, not many stations logged to date (German press, |

Vessels/Ships

- AMVER Position Reports
- Telex Traffic to Shore Stations
- Soviet Fishing Fleet

Point-to-Point

- Military
- World Air Forces, Navies and Armies
- Coded and "In-the-Clear" Message Traffic
- Military Flight Plans and Routings
- FAX Charts and Maps (Weather and Tactical)
- Naval High Seas Weather Broadcasts
- MARS (Military Affiliate Radio System) Traffic
- Coast Guard (American and Canadian)
- Coast Guard Communication Stations/CG Cutters
- FAX Weather Charts and Maps/Satellite Photos
- Iceberg Alerts (North Atlantic)
- Various Maritime Service Broadcasts

Press Agencies

- International News Agency Broadcasts
- Newspaper Press Photos (FAX)
- Non-Latin Alphabet Press (FAX)
- Chinese, Russian, Arabic, Japanese

Meteorological Stations (Worldwide)

- Forecast and Actual Weather Broadcasts
- Weather Charts and Maps
- Orbiting Weather Satellite Photos

Diplomatic/Government Embassies

- Inter-embassy Traffic/Ministry of Foreign Affairs

Law Enforcement

- INTERPOL Traffic
- Police Communications

Science and Research

- Antarctic Research Stations

| | |
|----------|---|
| FEC-S | German, Serbian and Indian embassies). Newer mode, not many stations/ frequencies logged to date. |
| HC-ARQ | Newer mode, Haegelin-Cryptos teleprinter system, European loggings. |
| HNG-FEC | (Hungarian FEC) Newer mode, used exclusively by Hungarian Embassies. |
| PACKET | Repetitive inter-computer traffic. Used by hams and MARS stations. |
| PACTOR | Newer "adaptive" amateur radio protocol. More reliable than packet. |
| PICCOLO | Used by British military almost exclusively. Now generally encrypted. |
| POL-ARQ | (Polish ARQ) New mode, used exclusively by Polish embassies. |
| RAC-ARQ | Newer mode, 150 Baud teleprinter system. No reports of any loggings. |
| RS-ARQ | Newer mode, Rhode & Schwarz simplex ARQ teleprinter system. |
| RTTY | Oldest and most widely used mode by all utility categories. |
| RUM-FEC | (Romanian FEC) Newer mode, used exclusively by Romanian embassies. |
| SI-ARQ | Newer mode, used primarily by Austrian and Indonesian embassies. |
| SI-FEC | Newer mode, no traffic reported to date by monitors. |
| SITOR | (Simplex Teleprinting Over Radio - aka ARQTOR/ FECTOR) |
| SITOR-A | Primary maritime mode used for inter ship/coastal station communications. Also widely used for diplomatic embassy traffic. |
| SITOR-B | Primary maritime coastal station broadcast mode for weather advisories and ship traffic lists. |
| SSTV | (Slow Scan TV) Used by hams to transmit still pictures. |
| SPREAD | Newer mode, used exclusively by Romanian embassies. |
| SWED-ARQ | (Swedish ARQ) Newer mode with usage limited to Swedish embassies. |
| TWINPLEX | Newer mode, used by INTERPOL and Danish/Norwegian MFA. |
| VFT | (Voice Frequency Telegraphy) British, Canadian and German military mostly, most difficult mode to tune due to multiplex (multi-channel) signal. |

■ VHF/UHF Digital Modes

| | |
|--------|--|
| ACARS | (Aircraft Communications Addressing and Reporting System) Digital air/ground traffic including aircraft telemetry. |
| FAX | (Facsimile) Weather satellite photos from orbiting Russian/American weather satellites. |
| POCSAG | (Digital Pager Code) Used to transmit telephone numbers and short alphanumeric text messages to personal pager units. |
| GOLAY | (Golay Sequential Pager Signalling System) A more sophisticated system used to transmit text messages to personal pager units. |
| PACKET | Repetitive inter-computer traffic. Used by hams. |
| RTTY | Commercial news services on satellite transponders. |

You'll notice that the list of HF modes contains many which are specific to the embassy traffic of one or more countries. Much of these transmissions are encrypted (coded). An analysis of digital HF signals from over 4,000 reported fixed station frequencies heard in North America during the past 12 months has revealed the following mode usage:

| | |
|------------|-------|
| RTTY | 53.7% |
| SITOR | 20.4% |
| ARQ-M | 11.1% |
| ARQ-E3 | 9.4% |
| ARQ-E | 4.5% |
| FEC-A | 0.7% |
| All Others | 0.2% |

■ Monitoring Equipment

To monitor digital transmissions you require a decoder. Decoders are available as independent outboard units or as an integral part of your personal computer system. In either case, they take the audio signal from your receiver and convert it to intelligible form that is displayed on a video monitor or the decoder's own "marquis-like" display. Many of today's decoders are also capable of translating Morse code (CW). A stable shortwave communications receiver is required for serious non-voice utility monitoring.

Only very recently have decoders become available for ACARS and pager modes in the VHF/UHF bands.

Most old-timers in the hobby originally started by listening to the international shortwave broadcasters. With the introduction of SSB modes, the true ute listener was born. Increasing use of Baudot RTTY on the airwaves saw the introduction of out-board decoders. Only the strongest and cleanest signals could be decoded by the early units — more

sophisticated monitoring required more expensive equipment, often in the form of surplus commercial hardware. Then in the 70's, Infotech introduced their high end decoders.

With the advent of satellite technology, RTTY monitors lost the myriad of frequencies once used by the major press agencies such as the Voice of America, Associated Press, and United Press International. With the demise of the Soviet Union, over 50 former TASS frequencies are now silent.

Despite the services that have now opted for newer communications modes, there is still plenty to monitor for today's digital utility enthusiast.

Some shortwave utility stations have fixed broadcast schedules, others transmit only when they have traffic.

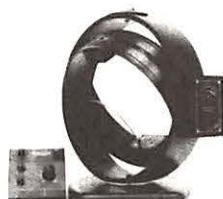
Most stations have several frequencies from which to choose. The general rule-of-thumb is that they will use the highest frequency that supports current propagation conditions during their local day, gradually moving to lower ones as local night falls.

Although most stations use very low transmitting power with respect to the international shortwave broadcasters, you will often be amazed at the strength of their signal. Digital transmissions, because of their signal nature often have a way of "getting through," especially during poor propagation conditions when the broadcast bands seem dead.

Many of the digital transmissions you will encounter are indecipherable. Military and embassy traffic of a sensitive nature is generally always encrypted (encoded).

When first starting out in this phase of the hobby, it is just as important to know "what not to listen to." All too often new monitors are easily discouraged because they are trying to decode the wrong signals. With patience and experience you will develop an "ear" for the various modes, and in many cases be able to identify the mode by its sound. Many experienced monitors can even audibly determine the baud rate.

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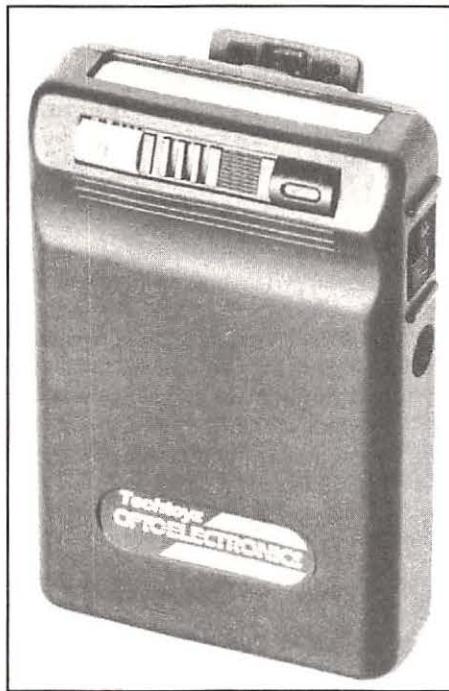
They say that the only difference between men and boys is the price of their toys. And Optoelectronics is doing all it can to see that we big boys have all the electronic toys we could ever want!

Optoelectronics has recently launched a product line called Techtoyz®, a series of electronic devices fitted into beeper-style cases. Currently, there are three products slated for this line, with the Micro DTMF Decoder currently shipping. Also available is the Micro Counter frequency counter, with a range of 10 MHz to 1.2 GHz. By the time this issue hits the newsstand, the Micro RF Detector (an RF field strength meter) should be in production. And yes, all three are top-quality, sophisticated electronic devices that fit inside a standard beeper case!

At first I couldn't believe it when I opened the package. The only discernible difference between the Micro Decoder and a regular beeper was the weight. The Micro Decoder was so light I thought it was an empty case. However, a flip of the switch proved it was a working model with the "AA" battery already installed.

The Micro DTMF Decoder may be small on size, but it's big on performance. It can decode all 16 DTMF digits and store up to 2,000 characters in non-volatile memory. The unit is capable of continuous operation for over 200 hours on a single battery. When a string of digits is received, and after a three second break, a space is inserted for readability.

The twelve character LCD display is the same as those used in a conventional beeper. By depressing one of two buttons, the display can be scrolled one digit at a time in either direction. Holding either directional button down results in a fast (but readable) continuous scroll. With a combination of two buttons, the display jumps to either the beginning or end of the



character string.

Another great feature of the Micro DTMF Decoder is its highly sensitive built-in microphone. This allows the decoder to pick up audible DTMF tones without any direct connection to the tone source. For example, DTMF tones emitted from speaker phones, modems, two-way radios, and scanners can all be easily decoded and stored discreetly. Depending on volume and clarity, the decoder is capable of capturing tones up to fifteen feet away. Given its performance, Optoelectronics must have gone to great lengths in designing the audio section of this device.

The decoder also has a miniature phone jack on the side of the unit for an external microphone or direct hookup to line-level input. This allows for a more stable and reliable connection to the signal source. To prevent interference, when the input jack is utilized, the internal microphone is automatically disconnected.

■ Practical Application of the Micro DTMF Decoder

Like any kid with a new toy, I couldn't wait to put the decoder through its paces. The first test was performed with my speakerphone. I put the decoder down a few inches from the speaker and dialed a number. At each key press, the digit instantly came up on the display. The next test was done with my computer modem. As the modem rapidly fired off the numbers, the decoder captured every digit.

However, when using the internal microphone, placement and distance from the speaker is relatively important. Too loud or too soft, and some digits may be dropped. The microphone is also somewhat directional due to its placement within the case. But with a bit of adjustment and a little experimentation, the decoder captured every digit flawlessly. Even when dialing at high speed, the decoder can capture at a rate of up to 12.5 digits per second.

Where the Micro DTMF Decoder is most reliable is in the direct connect mode of operation. By running a patch cord from the line jack of my PRO-2006, I was able to readily decode any DTMF tones received. The reliability of the direct connect was rock solid with no lost or incorrect digits during this tests.

If you're in the market for a DTMF decoder, you might want to check out this little unit, which sells for \$89. It has the features, functionality, and reliability of decoders costing twice as much. With Techtoyz, big things really do come in small packages!

The Micro DTMF Decoder is available from Optoelectronics, 5821 NE 14th Avenue, Ft. Lauderdale, FL 33334. They can be reached at 800-327-5912 or 954-771-2050.

WHAT'S NEW?

PRODUCTS AND BOOKS OF INTEREST

by Larry Miller

Contributors: Rachel Baugh, Bob Grove

His Master's Scanner

It's hard to believe, but another well-known firm has entered the ranks of scanning. RCA — yes, the same RCA that had Nipper listening to his master's voice — has introduced a line of three units.

The RP-6100 is a 20 channel handheld with 30 to 512 MHz coverage. It includes 20 channel memory, manual channel select, channel lock out, and NiCd recharge circuitry.

The RP-6150 is a 200 channel handheld scanner with 30 to 960 MHz coverage, 200 channel memory, two-second scan delay, memory backup, keypad lock, monitor memory, manual channel select, channel lock out, and NiCd recharge circuitry.

The RP-6200 is the base version of the '6100 and, like the '6100, it covers 30 to 512 MHz, has 20 channel memory, memory backup, keypad lock, monitor memory, manual channel select, and channel lock out.

All three scanners, with some minor differences, are apparently available as Radio Shack models. Still, the name RCA is powerful medicine and it will be interesting to see what the entry of this industry giant means to the scanning community. RCA scanners are available at Advanced Specialties Electronics, 114 Essex Street, Lodi, NJ 07644. Their phone number is 201-VHF-2067.

AM Sounds

It looks like an ear ache waiting to happen, but its manufacturer says that it's an AM radio so small that it fits in the side of your head. Called AM Sounds, it's just 1-1/8 inches long and weighs but a quarter ounce. Utilizing "sensitive TRF receiving circuitry and AGC control, AM Sounds is a self-contained unit — no cords, headphone wires, or clips to hang on your belt. Despite its small size, dial tuning lets you select the



exact station you want."

Tuning range is from 550 to 1600 kHz, missing the new expanded portion of the band. The radio runs 300 hours on one battery. The manufacturer (American Technology Corp.) says AM sounds produces "a rich, full, high-quality sound in one ear while the listener stays in touch with the surroundings with the other." They suggest many uses: jogging, hiking and — no kidding — *while talking on the phone*. Great idea.

To find out more about AM Sounds call 1-800-41-RADIO, visit their web site <http://www.atcsd.com>, or email atcinfo@atcsd.com.

Total Flexibility

The universal whip antenna, sold by Grove Enterprises as a replacement for inefficient stock antennas, has become even more useful with the addition of a spring-supported base for less breakability and greater flexibility. The universal whip extends from 7 inches to 47-1/2 inches, receives 25 - 1300 MHz, and is equipped with a BNC base.

The antenna is also available in a 4 - 21 inch length for omission of low band; with right angle connector for use with a desktop receiver; or with N adaptors. Prices vary from \$16.95 for

the standard whip to \$23.95 for the right-angle N adaptor. Grove Enterprises can be reached at 800-438-8155 or e-mail order@grove.net.

Fired-Up Firestik

Firestik has upgraded the performance of its A99 CB base antenna with a new replacement whip. The Fire-Up 99 is a 5-foot, top-loaded whip that replaces the A99's upper 6 foot continuous loaded whip. Upgrading the A99 is easy, says the manufacturer, a simple two-step procedure: simply unscrew the upper A99 whip and screw in the Fire-Up 99.

Firestik's 5/8 wave, top-loaded coil design creates a lower angle of radiation that translates into more distance on the ground. The antenna also features Firestik's patented bare-hands tunable tip for additional range.

The Fire-Up 99 has a suggested retail price of \$20.99. The Firestik Antenna Company can be reached at 602-273-7151 or by e-mail at fs99@firestik.com

CB Gentrification

When a ghetto gets so bad that no one wants to live there, prices drop to nearly nothing, and, sometimes, a process of *gentrification* begins — people migrate back from the suburbs to fix up the homes and re-establish neighborhoods.

Something like this is happening to CB. If you think of CB as a bombed-out radio ghetto inhabited only by psychotics and squatters, then you'll be happy to hear what's happening. Around the country, pockets of serious, professional, and courteous operators are once again springing up. Granted, you still have to step across someone sleeping on a steam vent, cursing and mumbling something about "good bud-



dies," but for the most part, things are taking an upturn.

If you're one of the growing numbers who is thinking — privately, of course — about testing the waters in CB, here's your chance. CBs have come down in price to match the near give-away status of 49 MHz cordless phones.

An example: VALCO, a Louisiana-based firm, is selling the Uniden PRO-501XL for all of \$28.37. If you can rustle up two friends who also want one, the price drops to \$27.80 each. The PRO-501XL is a compact, 40 channel CB with LED display, automatic noise limiter, phase lock loop circuitry, volume and squelch control, up/down channel selector, push-to-talk mike and full mounting hardware. For \$28.37, you can afford to buy several and throw all but one away!

To order, call VALCO at 800-673-2244. Their mailing address is 2450 West Laurel Ave., Eunice, LA 70535. Please mention *MT* when you call.

ERGO for the AR7030

Creative Express has announced computer control software for the AOR AR7030. Called ERGO, the program was developed by John Fallows of Calgary, Alberta.

"ERGO provides a comprehensive and integrated environment to control the AR7030," says John.

Here's a basic rundown of the program's capabilities: a friendly "virtual front panel" for the receiver with control over on/off, volume, frequency, tone, passband, squelch, gain, mode, and



more. Band scanning features including seeking the next station, profiling the entire band, and dual scan.

Four hundred quick memories can be scanned and synchronized with the receiver's memories—a user-defined 500 record database that can be used to tune or receive. The database can be filtered by frequency, station name, country, transmitter site, schedule times, group, or language. Propagation evaluation is given to any transmitter site in the database and signal strength is displayed in a bar meter or time-series scope.

A minimum configuration is Windows 3.x running on a 486/66 with 8 Mb RAM and 800 by 600 video. The recommended configuration is Windows 95 running on a Pentium with 16 Mb RAM and 1024 by 768 video.

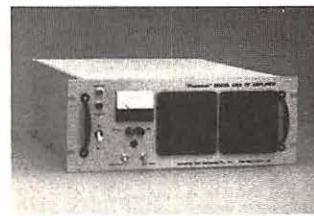
You can get a copy of ERGO for the AR7030 by sending a certified check or money order in the amount of US\$139 to Creative Express Corporation, P.O. Box 373, 16 Midlake

Blvd, SE, Calgary, Alberta, Canada T2X 2X7. You can get more info on ERGO by checking out their web page at http://calgary.shaw.wave.ca/~jfallows/ERGO_1.htm

The e-mail address is johnfallows@mail.ca. Mention MT when you write.

More Power

Looking for a nice 500 watt power amp? Industrial Test Company has introduced their new Powertron 500A, a punchy little unit that puts out 500 watts over a frequency range of 10 Hz to 1 MHz.



The 500A employs a closed-loop negative feedback circuit which ensures a low-output impedance (close to zero ohms). Full power is obtained with a load resistance of 1.25 ohms and 25 volts rms output voltage. However, any other combination of voltages (up to 15,000) and current (up to 200 amps) can be obtained through the use of an optional transformer. The 500A is fully protected against overloads and overheating.

ITC is located at 21 Yennicock Ave., Port Washington, NY 11050. Their phone number is 516-883-1700.

Radio London Lives

Thirty years ago, Radio London took to the airwaves off the coast of England. Clearly the most successful of the offshore pirates, the station had its start in Texas in 1964 and a short life



that ended at 3:00 pm, on August 14, 1967, the "Summer of Love."

In its heyday, Radio London had an audience estimated to be in the vicinity of 16 million; it made stars out of its DJs and launched the careers of countless pop stars. It was, by some estimates, the largest commercial radio station audience in the world.

This past summer, East An-

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- Fits on BACK or TOP mount scanner antennas inputs.

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"The Standard Against Which All Future Decoders Will Be Compared"

Many radio amateurs and SWLs are puzzled! Just what are all those strange signals you can hear but not identify on the Short Wave Bands? A few of them such as CW, RTTY, Packet and Amtor you'll know - but what about the many other signals?

There are some well known CW/RTTY Decoders but then there is CODE-3. It's up to you to make the choice, but it will be easy once you see CODE-3. CODE-3 has an exclusive auto-classification module that tells YOU what you're listening to AND automatically sets you up to start decoding. No other decoder can do this on ALL the modes listed below - and most more expensive decoders have no means of identifying ANY received signals! Why spend more money for other decoders with FEWER features? CODE-3 works on any IBM-compatible computer with MS-DOS with at least 640Kb of RAM, and a CGA monitor. CODE-3 includes software, a complete audio to digital FSK converter with built-in 115V ac power supply, and a RS-232 cable, ready to use. CODE-3 is the most sophisticated decoder available for ANY amount of money.

26 Modes Included in STANDARD package include:

- Morse *
- RTTY/Baudot/Murray *
- Sitor CCR 625/476-4
- ARQ - Navtex *
- AX25 Packet *
- Facsimile all RPM (up to 16 gray shades at 1024 x 768 pixels) *
- Autospec - Mk's I and II
- DUP-ARQ Artrac
- Twinplex
- All modes in typical baud rates with possibility of changing to any desired value of speed and shift.
- User can save incoming data to disk in either ASCII or raw bit form.

26 Modes Included in STANDARD package include:

- ASCII *
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- SI-ARQ/ARQ-S
- SWED-ARQ-ARQ-SWE
- ARQ-E/ARQ1000 Duplex Variant
- ARQ-N-ARQ1000 Duplex Variant
- ARQ-E-CCIR519 Variant
- POL-ARQ 100 Baud Duplex ARQ
- WEFAX *

26 Modes Included in STANDARD package include:

- ARQ-6-70
- Baudot F788N
- Pactor *

26 Modes Included in STANDARD package include:

- TDM242/ARQ-M2/4-242

26 Modes Included in STANDARD package include:

- TDM342/ARQ-M2/4

26 Modes Included in STANDARD package include:

- FEC-A FEC100A/FEC101

26 Modes Included in STANDARD package include:

- FEC-S + FEC1000 Simplex

26 Modes Included in STANDARD package include:

- Sports into 300 baud ASCII

26 Modes Included in STANDARD package include:

- Hellschreiber-Synch/Asynch *

26 Modes Included in STANDARD package include:

- Sitor • RAW (Normal Sitor but without Sync.)

26 Modes Included in STANDARD package include:

- ARQ-6-70

26 Modes Included in STANDARD package include:

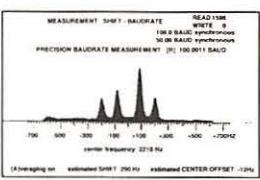
- ROU-FEC / RUM-FEC,

26 Modes Included in STANDARD package include:

- HC-ARQ (ICRC) and HNG-FEC *

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glican Productions resurrected Radio London, bringing back the original staff and music and putting the whole operation on the air from another ship. To celebrate, the station has released a whole raft (no pun intended) of items, including books, CDs, and memorabilia.

The Wonderful Radio London Story is a triple CD narrated by former RL announcer "Cardboard Shoes" Keith Skues. The CD contains interviews with the station's founders, jingles, airchecks, commercials, and more, with excerpts taken from sign-on on December 1964 until sign-off in 1967. The CD is £29.95.

Another CD, a double, contains the production masters from the station, including the PAMS jingles and production beds. There are 198 jingles and promos; the cost is £21.99.

Chris Elliot has written the companion book, *The Wonderful*

Radio London Story, a 324 page hardback with 40 photos and illustrations. It is £24.99.

Finally, no life would be truly fulfilled without the Big L/Tony Windsor Commemorative Coffee Mug. Windsor ("T - Hel - o - W") was the senior DJ on Radio London, now deceased. The mug is £4.95.

To order, use your credit card and fax East Anglican Productions at 01255 850528. Mail orders go to EAP, Dept. Radio London, Studio House, 21-23 Walton Road, Frinton-on-Sea, Essex, CO13 0AA UK The e-mail address is:

EAP@COMPUSERVE.COM

Business Notes

- One of our readers passes along this warning to anyone purchasing an AOR AR-8000 from outside the U.S. In addition to the risk you are taking that it could be

seized by Customs, there is also the likelihood that the radio will not be set up with the U.S. bandplan, and the distributor may not accept that as sufficient reason to allow it to be returned for refund. Be sure to ask before you purchase.

- Readers will be interested in two significant price drops, avail-

able from Grove. The Radio Shack PRO-26 wide coverage handheld scanner is being offered for \$200 less than the original selling price: now \$249.95. The ICOM R8500 tabletop scanner goes for \$150 less than its usual Grove price until October 31st, 1997. Call Grove at 800-438-8155 for more information.

Books and equipment

for announcement or review should be sent to

"What's New?"

c/o Monitoring Times,

P.O. Box 98, 7540 Hwy 64 West, Brasstown, NC 28902

Press releases may be faxed to 704-837-2216 or e-mailed to *mtditor@grove.net*.

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Lowe SRX100/Target HF-3

The tabletop model Lowe SRX100, sold in North America for \$279.95, is something of a surprise. The bargain hunter in us whispers, "Lowe and behold, it looks a *lot* like the Lowe HF-150. Maybe it's nearly as good, but much cheaper." Unfortunately, this isn't quite the case.

■ "Bucket brigade" distribution successful

For starters, the Lowe SRX100, despite appearances, is a Lowe in name only. It is actually the creation of a completely different British firm which markets it in the U.K. and Europe as the Target HF-3. (There is no indication as to the country of origin on our unit.) In North America, it is sold as the Lowe SRX100 through yet another intermediary, Virginia's EDCO (703/938-8105).

It is remarkable that a product with this many steps of distribution—from the U.K. originator to the U.K. exporter to the North American distributor to North American retailers...and only then to the consumer—comes through at such a reasonable price across the Pond.

■ Simple little receiver

Housed in a plastic case with a top-mounted speaker, the SRX100/HF3 is only slightly larger than a brick. On the front panel, there are just three knobs (on/off-volume, tuning, and clarifier), four buttons (two for modes, one for memory storage, and another for memory recall), and an easy-to-read digital display. That display shows mode, frequency, and signal strength via digital bars. But because the display is not illuminated, when it's dark you'll need a flashlight.

On the rear panel is an attenuator, the antenna socket, a connector for the external "wall wart" AC adaptor, and a jack for a headphone or external speaker. If you're looking for *simple* in a tabletop receiver, aside from the Drake SW1 this is "it."

The radio covers from 30 kHz to 30 MHz in the AM, upper-sideband and lower-sideband modes, but there is no synchronous selectable sideband. Of the two bandwidths, nominally 3.8 kHz for single-sideband and 6 kHz for AM, neither can be selected independent of mode. Tuning options are limited, as there is only one (!) solitary memory preset, and you'll find neither a keypad nor provision for connecting one.



■ "Hydramatic" tuning knob

The tuning knob uses variable-rate incremental tuning (VRIT) with four speeds—10/100 kHz and 1/10 MHz—which are automatically shuffled in and out depending upon how fast you turn the knob. Imagine, if you can, going from the nethermost longwave spectrum to the upper reaches of the shortwave spectrum in but three turns of the tuning knob. Spin it one calorie too vigorously, and suddenly you find yourself in a new dimension of time and space—or at least several megahertz up or down the world band spectrum from where you were.

Additionally, there is no device, such as flip-down feet or an elevation rod, to prop the receiver at an angle that is comfortable for operation. As a result, when spinning the tuning knob, you can keep rapping your knuckles on the tabletop. You can resolve this by using a homebrew prop or by picking up the receiver with one hand—it's very light—and spinning the knob carefully with the other.

Over time you get accustomed to playing "spin the dial and see where it lands." Of course, "you get accustomed to it" is the refrain used to excuse every manner of ergonomic shortcoming from a poor-contrast display to a jail cell, but this one is particularly puzzling. After all, what is the point of a 10 MHz-per-revolution tuning rate on a receiver that covers less than 30 MHz?

A lesser annoyance is that when the receiver is turned on, it automatically brings up the frequency and mode that are stored in the memory preset, not the last-tuned station. Too, if you want to change that mode, you must use the up or down button.

But there's a rub. If the receiver is in the upper-sideband mode, you cannot poke the up button again to access the lower-sideband or AM modes. No, you must use the down button to get there. And, if the receiver is in the lower-sideband mode, the only way to you can get to the AM or upper-sideband modes is with the up button. Of course, if the receiver is in the AM mode, you press "up" to access upper sideband

and "down" to access lower sideband.

Since there are only three modes, it would have made more ergonomic sense to have had a carousel-style access of all modes through either the up or down button, rather than a mix of both.

■ Whale of a warbling wail

Tuning the receiver in the AM mode to a world band station is straightforward. However, tuning in a single-sideband signal, such as a ham or utility station, is less so. To begin with, tuning is a two-control exercise. First, the tuning knob is used to tune as close as possible to the desired signal. Next, the clarifier knob, which has a frequency adjustment of plus or minus 800 Hertz, is tweaked to make the signal readable.

Among world band listeners, there is a time-honored technique—sometimes called exalted-carrier selectable sideband, or "ECSS"—that is used to banish or lessen adjacent-channel interference. That is, where you manually tune a world band station—which, of course, is in the double-sideband AM mode—in either the upper- or lower-sideband mode. Unfortunately, this technique, which calls for the fingers of a neurosurgeon and the ears of a bat, does not come off well with the SRX100/HF3. Too, the receiver does not automatically compensate for the BFO offset that results when you switch from the AM mode to either upper or lower sideband.

Suppose, for example, you are listening to a station on 5070 kHz in the AM (double-sideband) mode, and you think that tuning to one sideband or the other might result in less adjacent-channel interference. Press the button to USB, and you have to tune to 5072 kHz to prevent the receiver from howling like a scalded cat. If you change to LSB to see if it sounds better than USB, you must then retune to 5068 kHz—a jump of 4 kHz—to prevent a similar banshee wail.

But the problem doesn't end here, as it is impossible to use the clarifier control to produce normal audio. An unsteadiness, seemingly in the synthesizer, prevents the sort of relatively clean zero beat you get on many other receivers. Even with practiced hands and a safecracker's touch, we couldn't make the SRX100/HF3 properly "listen" to an AM station in ECSS, and regular single-sideband reception fared little better.

A niggling complaint is that the volume/on-

off control, at least on our unit, is decidedly non-linear—that is, move the knob just a little bit, and you go from soft to much louder in an instant. In addition, the microprocessor resets itself and goes to whatever frequency is stored in the memory preset if you turn down the volume to where you encounter resistance from the click-stop.

■ Performance superior for price point

The ultimate rejection of the two bandwidths is of superset caliber—nothing short of superb! Yet, although the 6 kHz bandwidth actually measures a commendable 5.6 kHz, the shape factor is only a mediocre 1:3, for a barn-broad 17 kHz wide at -60 dB.

The 3.8 kHz SSB bandwidth measures 4.8 kHz in our lab, so the two bandwidths are in fact quite similar, even though the shape factor of the single-sideband bandwidth is good. Had this bandwidth met factory specs, which is really too wide for most SSB applications anyway, it would have been a good second bandwidth for AM-mode listening. Unfortunately, it doesn't matter, as on this receiver bandwidth cannot be selected independent of mode.

Image rejection is excellent, which is especially important for 60 meter tropical band reception. However, first IF rejection is poor, which means that under certain unusual circumstances the receiver will be susceptible to interference from nearby powerful stations.

Dynamic range is fairly good, but what really counts for strong-signal handling is that the third-order intercept point is excellent-to-superb. This is quite an achievement at any price point, but at \$280 is exceptional. On the other hand, sensitivity is only fair.

When listening to a broadcast that is free from interference, this receiver sounds pretty good, and our lab measurements help explain why. Although overall audio distortion at lower audio frequencies is 10-15%—a poor showing—it improves markedly to excellent-to-superb at higher audio frequencies. That low-frequency distortion may make for some listening fatigue over time, but as a practical matter audio quality is right up there with the best in this receiver's price class.

■ A bargain, but...

The Lowe SRX100 and Target HF3 are low-cost bargains in tabletop models. After all, \$280 is extremely attractive for this level of performance. With higher-quality bandwidths selectable independent of mode, improved weak-signal sensitivity and a less "twitchy" VRIT, these little radios would be hard to beat anywhere near their price points.

Nevertheless, these two receivers have substantially better signal-handling capability than such top-rated portables as the \$350 Sony

ICF-2010—and even many pricey tabletop models. If you are to connect your receiver to a high-gain outboard antenna, this is a major virtue you would not expect to find except in sets costing several times more.

This equipment review is performed independently by Lawrence Magne and his colleagues in accordance with the policies and procedures of International Broadcasting Services, Ltd. It is completely independent of the policies and procedures of Grove Enterprises, Inc., its advertisers and affiliated organizations.

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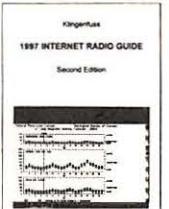
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SCANNER EQUIPMENT

EQUIPMENT AND ACCESSORIES FOR YOUR MONITORING POST

Bob Parnass, AJ9S

Radio Shack PRO-67 Portable Scanner

Radio Shack is expanding the use of triple conversion circuitry in its scanner product line with the new PRO-67 portable. Like its double conversion PRO-51 predecessor, the 200 channel PRO-67 is manufactured for Radio Shack by Uniden.

AM and NFM modes are factory set and not selectable. Frequency coverage includes the VHF-low, VHF-high, commercial air, UHF, and 800 MHz bands. The designers censored frequencies adjacent to the cellular phone bands, so our PRO-67 will not receive 868.9625 or 823.9625 MHz. These two frequencies are licensed to several local and state governments, including the Illinois State Police trunked system around Chicago.

Memory Organization and Scanning

The PRO-67's 200 memory channels are divided into 10 banks. Memory backup is specified to be three days during power loss. The Philippine-made PRO-67 lacks some of the features found in upscale models. For instance, the PRO-67 does not alert you when programming a duplicate frequency in memory.

A 2-second rescan delay may be selected for individual channels.

We measured the scan rate at a blazing 68 channels/sec — fastest of all the models we've



Radio
Shack
PRO-67

tested. Empty channels, those programmed with 0.0, are automatically ignored during memory scan.

Users may designate one priority channel in each of the 10 memory banks. The PRO-67 checks each of the priority channels every 2 seconds while scanning or in manual mode, but not during searches.

Frequencies can be saved in any of 10 Monitor channels and later transferred individually to conventional memory.

Searching for Activity

The PRO-67 provides three ways to search for signals: Direct, Bank, and Service searching. Direct search, using the up and down arrow keys, searches from the display frequency in the direction of your choosing.

One pair of user programmable limits is provided for bank searches.

Service search hunts for activity among preprogrammed air, marine, fire, and weather frequencies. There is no police service search — an omission we consider peculiar, given that police monitoring is arguably the most popular use for a scanner radio. Police service search was missing from the earlier PRO-51 model, too.

You can lock out up to 20 frequencies during searches and review each one later, unlocking frequencies if you like.

Powered by AA Cells

The PRO-67 battery compartment is located at the lower rear quadrant and holds four AA cells. A small slide switch located above the batteries selects alkaline or NiCd. If the switch is set to NiCd, an optional wall barndale power supply (RS #273-1665) can be used to power the scanner from 117 VAC and recharge the batteries simultaneously. An optional DC adapter (RS #270-1560) can do the same thing using an automobile 12 VDC electrical system instead.

The PRO-67's current requirements are frugal and ours draws only 65 mA while scanning. A battery save circuit reduces cur-

rent drain in Manual or Program modes after 5 seconds of silence and no keyboard activity. An icon on the display shows whether the battery save mode is active, and you can disable the battery saver completely by pressing the Priority key during power up.

Fine Display

The PRO-67 LCD display is much easier to read than the PRO-64 we tested last August. It maintains sharp contrast when viewed from several angles and the frequency digits are larger. Pressing the Light key illuminates the display boldly for 15 seconds using amber colored LEDs.

Keystrokes are confirmed by a beep tone, though the tone can be disabled by pressing the L-OUT key during power up.

Performance

Our PRO-67's small speaker produces audio of average quality, which distorts as the

MEASUREMENTS

RADIO SHACK PRO-67 PORTABLE SCANNER

S/N 75010355

Frequency coverage (MHz):

29 - 54 (5 kHz steps)
108 - 136.975 (AM, 12.5 kHz steps)
137 - 174 (5 kHz steps)
406 - 512 (12.5 kHz steps)
806 - 823.9375, 851 - 868.9375,
896.1125 - 1000 (12.5 kHz steps)

Sensitivity: see graphs

FM modulation acceptance: 13.5 kHz

Image rejection due to first IF:

59.5 dB @ 155.5 MHz

Practical memory scan speed: 68 ch/sec.

Search speed, Hyper: 243 steps/sec.

Search speed, regular: 94 steps/sec.

Current consumption at 6 VDC:

off - less than 20 μ A

scan - 65 mA

full volume - 142 mA

Battery saver: after 5 seconds in

Manual mode.

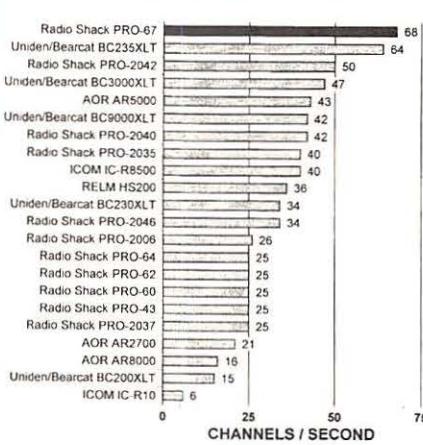
Low battery warning at 4.46 VDC or less.

Shutdown at 4.33 VDC VDC or less.

Intermediate Frequencies:

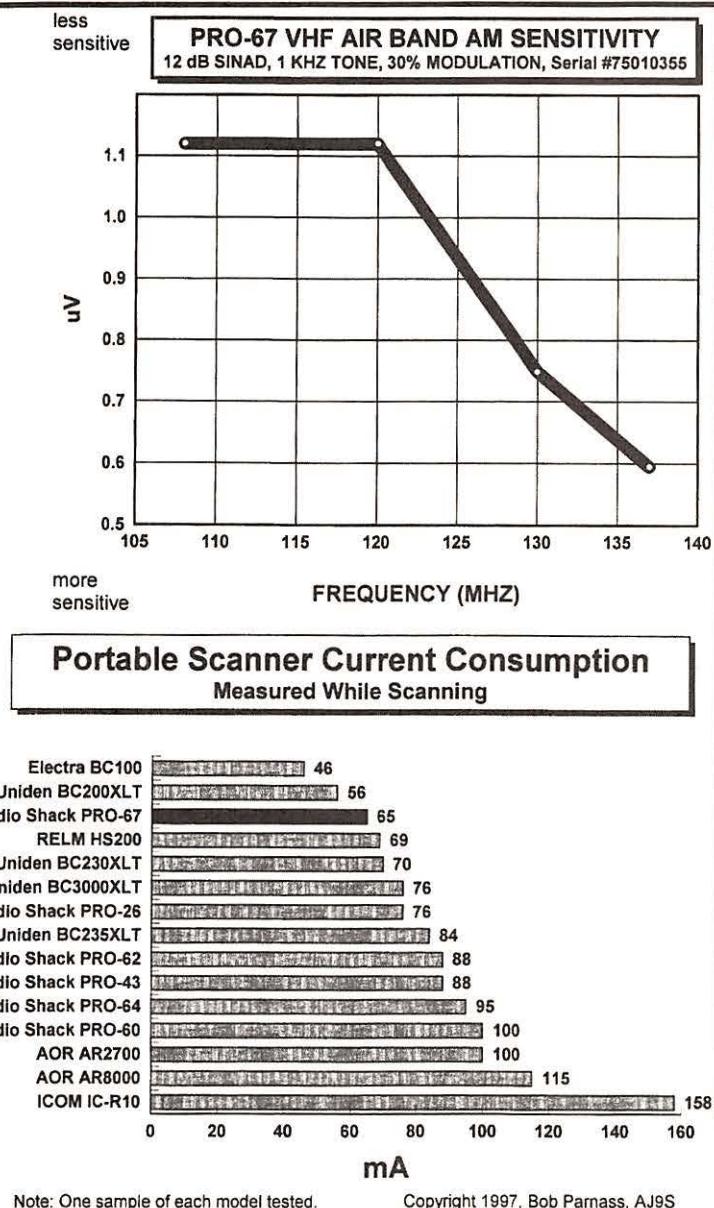
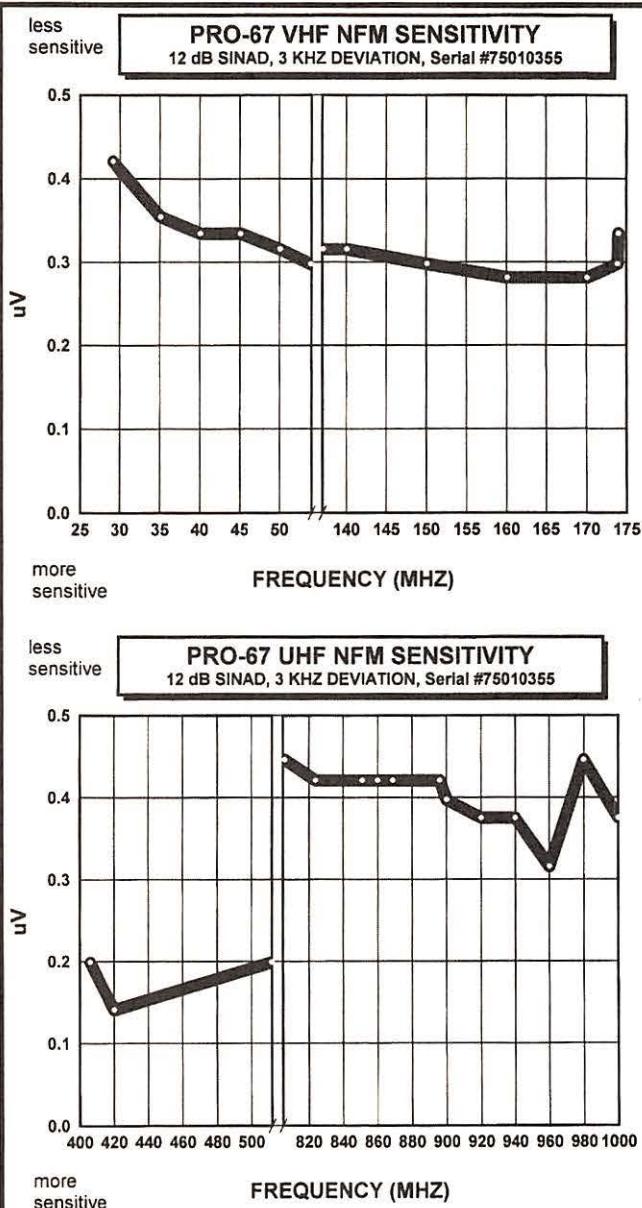
254.4, 10.85, and 0.45 MHz

PRACTICAL MEMORY SCAN SPEED



Notes:
1. Measurements made on one sample of each model.
2. Measured with memories programmed with unsorted frequencies in various bands and AM and NFM detection modes.
3. Measurements are approximate.

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volume control is advanced. Squelch action is acceptable, with the proper amount of hysteresis. The PRO-51's squelch tail is too long, producing a long noise burst at the end of each transmission. The PRO-67 squelch tail is shorter, though still noticeable.

We took the PRO-67 on vacation and put it to work monitoring local police, business, and motel frequencies. Practical use, along with test bench measurements, shows our scanner has little intermod and adequate sensitivity (see graphs). The PRO-67 and BC-235XLT share the same IF scheme, and the 254.4 MHz first IF accounts for very good image rejection — almost 60 dB at 155.5 MHz. That said, we do receive an image of TV channel 26 audio (547.75 MHz) near 39.05 MHz when using an outdoor antenna.

Our PRO-67 is clean in the 160 MHz railroad and 800 MHz land mobile range,

though we experience some adjacent channel interference from stations on UHF 12.5 kHz away when using an outdoor antenna. We measured the PRO-67's cellular rejection to be 49.5 dB in the VHF-low band. The signal-to-display frequency relationship on the VHF-low band is:

$$\text{actual transmitter frequency (in MHz)} = 763.2 + [2 \cdot \text{display frequency}]$$

For example, we can hear an 870.0 MHz signal when the PRO-67 is programmed to 53.4 MHz, though the 12 dB SINAD sensitivity is only 89 uV — on par with a turnip.

In Closing

Our PRO-67 is a good performer, with fast scanning and image rejection superior to the double conversion PRO-51. The PRO-

67's wide angle display, simple battery requirements, and low current drain are assets we long for in other models. Drawbacks include missing trunked frequencies adjacent to the cellular phone segments and omission of preprogrammed police frequencies. We consider the list price of \$300 steep, so watch for sales.

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Hex Conversion Made Easy

This month's tip comes from *MT* staffer Doug Smith.

"I noted in your August *Tracking the Trunks* a few recommendations for converting Motorola hexidecimal ID codes to Trunktracker decimal codes. It's easy math to those of us who have done some computer programming over the years, but maybe a bit obscure to those who haven't."

"Luckily, anyone with a Windows 3.10/95 PC can do this math with computer assistance."

"Open the Accessories window and locate Calculator. Run it. Pull down the View menu and select Scientific."

"If you want to convert a decimal number to hex, click the Dec button at the upper left of the window. Type the number (it appears in the box at the upper right). Now click on the Hex button; the number in the box is converted to hex."

"To convert a hex number to decimal, reverse the process. Click the Hex button, type the number you want to convert, and click on Dec."

"Of course, calculator is also handy for doing the necessary multiplication/division by 16. Be sure to do this step while the number is in decimal, in the order Greg Knox explained in your August column. This is because 16 hex is really 22."

Thanks a bunch, Doug, for the tip. I use that calculator every time I work on this column in checking fleet group idents.

■ Any Questions?

Q. When I try to monitor trunked radio from 855-860 MHz on my Radio Shack PRO-39 Hyperscan scanner, I hear mostly images of cell radio phone conversations from 21.4 MHz higher. These cell phone conversations are stronger than the trunked system that I am trying to monitor.

How is the image rejection in this band for the Bearcat BC-235 XLT radio? Does this Trunk Tracker have the same problem? (William Tobin-Alaska)

A. The Trunk Tracker is a triple conversion radio and it is the first Uniden radio that has excellent image rejection capability. The PRO-39 scanner (made for RS by Uniden) is double

conversion. Like most Uniden double conversion receivers the PRO-39 does a poor job of image rejection.

I have personally tested the Trunk Tracker in one of the worse RF intermod/image areas of the country: in downtown Atlanta on Interstate 75/85 in front of the former Olympic village. There wasn't even a hint of a intermod/images.

Q. The Bearcat BC-235 XLT is advertised as being able to track only Motorola trunk systems. How do we know which systems are Motorola trunked systems? It would not be worth getting a BC-235 XLT if the trunked radio in our city were not Motorola. (William Tobin-Alaska)

A. If you buy that Trunk Tracker from Grove Enterprises, that won't be a problem since you have a 30-day, no questions asked, money back guarantee.

To give you a more straightforward answer, it is pretty simple to find out locally if the Trunk Tracker will work in your area. Turn on the scanner you have now and plug in the 800 MHz frequencies of the trunk system you want to monitor. Listen to one of the active frequencies and if you hear a set of tones after the conversation is over that sounds like the jingle used in General Electric commercials—don't buy a Trunk Tracker: You have a GE/Ericsson system in your location and the 235 will not follow that trunk.

If you hear nothing but hiss on the trunk frequencies then that is probably a digital system and the 235 won't follow that, either. Any other system should be a Motorola analog system and the Trunk Tracker will work fine.

You last alternative is to call our tech support line and see what information we have on file about your local system. That number is 704-837-7081 between 8 a.m. to 5 p.m. Eastern Time, Monday through Friday.

■ System Profile

This month's trunking system profile is courtesy of Albert Chailowa in the Garden State. Albert sent in information on the New Jersey State Patrol—Troop A.

If you have information on your local system you would like to share with your fellow *MT* readers, we want to hear from you. You can write us at: *Tracking the Trunks*, P.O. Box 98,

Brasstown, NC 28902 or via email to trunktracker@grove.net.

New Jersey State Police (Troop A) South Headquarters: Hammonton

Stations: Absecon, Atlantic City Expressway (Hammonton), Bridgeton (Seabrook), Bellmawr, Berlin, Mays Landing, Port Norris, Red Lion (Vincetown), Tuckerton (West Creek), and Woodstown

System Frequencies: 855.2125, 855.4625, 855.7125, 856-860.4375, and 856-860.9375 MHz.

National Public Safety Calling and Mutual Aid (Tone 156.7 Hz):

866.0125 (Calling), 866.5125 (Tac 1), 867.0125 (Tac 2), 867.5125 (Tac 3), and 868.0125 (Tac 4)

System Fleet Map: Motorola Type II analog Sub Fleet Identifications

| | |
|--------|--------------------------------|
| 000-0 | Fleet 1 (Fleetwide) |
| 000-1 | Division Calling |
| 000-2 | Headquarters (Hammonton) |
| 000-3 | East 3 Dispatch |
| 000-4 | South Bridgeton Dispatch |
| 000-5 | West Bellmawr Dispatch |
| 000-6 | Marine Units |
| 000-7 | Operations (Car to Car) |
| 000-8 | Command Post Operations |
| 000-9 | Int Operations (Car to Car) |
| 000-10 | Aviation Units |
| 000-11 | Executive Security |
| 000-12 | Atlantic City Expressway |
| 000-13 | Unassigned |
| 000-14 | New Jersey Turnpike |
| 000-15 | Garden State Parkway |
| 400-0 | Fleet 2 (Fleetwide) |
| 400-1 | Attorney General |
| 400-2 | Corrections (3B) |
| 400-3 | Gaming Enforcement |
| 400-4 | Department of Criminal Justice |
| 400-5 | Detectives Dispatch |
| 400-6 | Investigators |
| 400-7 | Investigators |
| 400-8 | Investigators |
| 400-10 | Medevac (not in use) |
| 400-11 | Human Services Police |
| 400-12 | Unassigned |
| 400-13 | Unassigned |
| 400-14 | Emergency Management |
| 400-15 | Corrections (3A) |

26640
26672
26704

26736
26768
26800
26832

26864
26896
26928

26960
26992
27024

27056
27088
57296

Superintendent
Troop Commanders
Spare

Spare
Corrections (3C)

SouthStar Helicopter
NorthStar Helicopter

Spare
Narcotics
Spare

Spare
State Aquarium
Spare

New Jersey Turnpike (Car to Car)
Parkway Headquarters
Fleet 3 (Fleetwide)

Now Available from Grove: TrunkTracker BC895XLT

The enormous success of Uniden's hand-held BC235XLT Trunk Tracker is now complemented by the new BC895XLT, the most powerful monitoring tool available to the scanning enthusiast. Designed not only for serious scanning of conventional VHF/UHF land, sea, and air communications, but for automatically tracking Motorola trunking systems (I, II, III, and hybrid) as well! Triple conversion design enhances the performance of this new trend-setter.

Featuring 29-54, 108-174, 406-512, and 806-956 MHz frequency coverage (less cellular), 300 memory channels in 10 banks, trunk search and scan capability with 50 group identifications per system, selective lockout and delay, instant weather access with storm alert, lightning-fast Turboscan (100-300 channels per second), built-in subaudible tone squelch (CTCSS/PL), RS232 computer control port, rotary tuning dial as well as direct keyboard frequency entry, 10 priority channels, bargraph S meter, automatic storage of search-discovered frequencies, data skip, and even a real-time trunking activity indicator.

Powerful 2.7 watt audio punches through the noisiest environments, or you can substitute an external speaker and even add a tape recorder from separate jacks. Ruggedly built and compact, the 3-1/2 pound scanner measures 10-7/8" W x 3-3/8" H x 7-1/2" D and is powered by an AC adaptor (provided) or your optional mobile DC. Telescoping whip and complete owner's manual are included. See detailed specifications in the center of this Guide.

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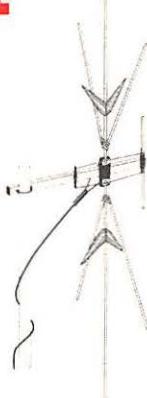
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Some Thoughts on Multi-band Antennas

An antenna which covers more than one band is called a "multi-band" antenna. Some multi-band designs are simply several antennas designed for different bands but connected to the same feedline as shown in fig. 1A. Some multi-band antennas utilize trap circuits to accept or reject signals of certain frequencies and automatically route the desired signal to appropriate elements in the antenna (fig. 1B).

In an interesting and well-written article¹ Barker reports on an antenna utilizing a less-common technique of automatic frequency routing. This antenna, the multi-band, multi-layered, multi-resonant antenna (MMMA), has some features which are interesting to consider. Let's take a look at them.

The Multi-band, Multi-layered, Multi-resonant Antenna

The MMMA utilizes a "choke" to tune various portions of the overall antenna's length. This method is found in some commercial multi-band designs. Let's see how it works.

In fig. 1C we see an MMMA section designed for operation at two frequencies which we'll call F1 and F2. Length L1 is designed to support operation on F1, the lower of the two design frequencies. L2 is a quarterwave long at F2, and L3 is a halfwave long at F2. Note that where L2 parallels L1, the two wires form what can be thought of as a quarterwave section of two-wire transmission line. Note also that this transmission line section is shorted at its end farthest from the feedpoint.

A shorted quarterwave length of feedline presents a very high impedance (opposition to current flow) at its unshorted end. Obviously then, current flowing between the antenna feedpoint and the open end of this line section will encounter a high impedance at the open end of the transmission line. That high impedance greatly reduces current

flow past the open end of the transmission line section, and thereby effectively isolates wire L4 from the part of L1 on past L4. This isolated length, L4, on the wire L1 is functionally a quarterwave long at F2, and supports the antenna's operation at F2.

Barker suggests the MMMA will function using one section of the general type shown in fig. 1C operated against the earth (fig. 1D), or operated against a counterpoise consisting of another section identical to the first section (fig. 1E). He also suggests that two sections can be connected to form a halfwave dipole (fig. 1F).

Barker's comments that a single section of the MMMA can be used as a longwire antenna should not be interpreted to mean that it will function at its full potential by simply connecting it to a coaxial feedline which runs to our receiver or transmitter. He specifically mentions that such an antenna should be operated with a good earth ground. Due to this, we should probably think of the grounded MMMA not as a longwire, but more as a grounded Marconi quarterwave antenna.

On the other hand, it is interesting to note that one section of the MMMA, or any other sizable length of wire, will often support decent reception over much of the HF band

without the addition of a ground connection, counterpoise, radial, or anything else. Such an antenna or wire needn't be resonant nor match the feedline well for this reception. This is because reception on the HF band is limited not so much by the signal level delivered from the antenna as it is by the ratio of received-signal level to received-noise level (signal to noise ratio).

Thus, mounting a single section of an MMMA, or any sizable length of wire, high and in the clear, will often give decent reception of many HF signals. Nevertheless, when noise is exceptionally low on the HF band, having an antenna resonant and well-matched to the feedline can lead to better reception.

Let's Model an MMMA

To get a feel for the operation of the MMMA I designed one to cover both 160 MHz and 100 MHz. Nevertheless, my antenna's operating frequencies were not at 160 and 100 MHz as I had designed them to be. Cutting the MMMA, or any other antenna, to length as given by the formula normally utilized to determine antenna length almost always gives an operating frequency somewhat different than the one you enter into the formula.

This seems to be unavoidable due to varia-

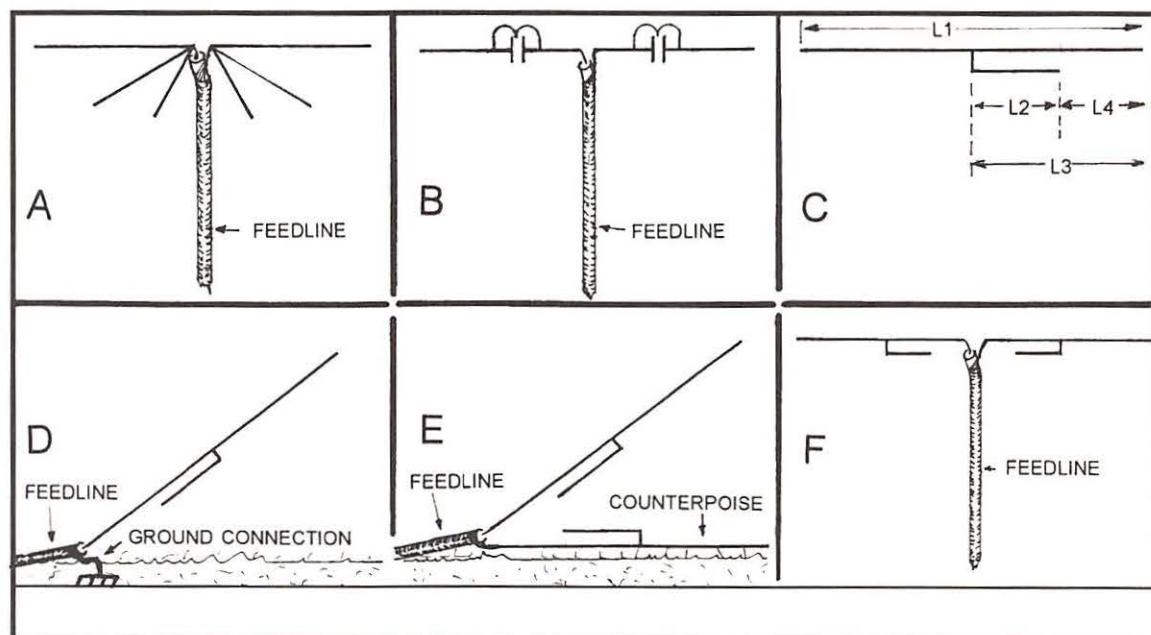


FIGURE 1. A Multi-element dipole antenna (A), a trap dipole antenna (B), a single choke-antenna section (C), a choke antenna with earth ground (D), a choke antenna with a counterpoise (E), and a dipole choke antenna.

tion in environmental factors between different locations. These factors include proximity to the earth and to various buildings or other structures in the antenna's general vicinity. As suggested below, coupling between multiple elements in an antenna can also cause the operating frequencies of an antenna to significantly depart from calculated values. Getting a formula-cut antenna to be resonant at the operating frequency you desire usually requires measurement its resonant frequency, and then adjusting its length as necessary.²

With the MMMA wires bundled tightly together and taped in place as suggested by Barker the antenna functioned at F1 with an SWR of approximately 1:1, and at F2 with approximately 1.65:1. As the wires are increasingly separated, the SWR at F2 improved to about 1:1 with a separation of about 1/2 inch. The SWR at F1 remained around 1:1 throughout the tests. The resonant point for both F1 and F2 moved closer to their intended design frequencies as the wire separation increased. This is most likely due to less coupling between elements as separation is increased. Similar results were obtained with an HF model.

Thus, it seems that this type of antenna functions better with its stubs separated well from the main antenna wire (L1) than it does with the various elements bound tightly together. Separations of 1/2 inch or more for VHF, and 2.5 inches or more for HF should improve the antenna's performance for weak-signal work in low received-noise conditions.

Positioning L2 at right angles to L1 gave SWR values for F2 that were comparable to those at 1/2 inch spacing. This changes the antenna's mode of F2 operation from choke isolation to operating the wire length L2 + L3 at its third harmonic. This orientation of L2 is not recommended, as it would result in an antenna that is awkward to handle.

In summary, the MMMA seems to be a decent design which would likely function better in low-noise situations if the elements were separated. Replacing the earth ground with radials would increase the efficiency of a single section antenna, especially for transmitting.

RADIO RIDDLES

Last month

I asked: "In our discussion of received interfering signals why haven't we covered those pesky 'birdies' we sometimes hear scattered across our dials?" Well, it's because birdies are not received signals! They are spurious signals generated within the receiver itself. A

birdie sounds as if it is a continuous, unmodulated, received signal, and is always tuned in at the same spot on the dial. Receivers of good design have few, if any, birdies.

This Month

What, if any, is the difference between a "broadband antenna," and a multi-band antenna? Can an antenna be both broadband and multi-band?

You'll find an answer for this month's riddle, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.

¹ May 1997, *Monitoring Times*, pg 18-20. Corrections for some lengths given incorrectly in Baker's article are reported in July 1997, *Monitoring Times* pg 4.

² Automatic SWR meters such as the MFJ, AEA, or Autek are ideal for this.

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Q. Does the size of the crystal in a crystal radio make any difference in how well you hear the signal?
(Donald Michael Choleva, Euclid, OH)

A. Probably not the way you would expect. The important characteristic is the ratio between the forward and reverse resistance; the amount of current which flows is infinitesimal, so mass is not important. As a matter of fact, the best semiconductor detectors, as used in crystal sets, are the smallest. This is why the early cat's-whisker detectors used such a fine point to find a "sweet spot" on the mass of lead sulfide crystal (galena).

Q. I subscribe to one of those pagers that keep you posted on major fire and EMS incidents as they are occurring. Is there any addition I can make to help it receive at a further distance?
(Wanda Hickey)

A. Pagers utilize internal loop antennas which are, by their very location, of limited size.

Since you don't know where the loop is physically placed, and assuming you don't have an external antenna jack, you might try the following experiment:

Install a rooftop scanner antenna, complete with coax cable routed down to the prospective pager location. If you have a connector on the bottom end of the coax, you will need a mating chassis-mount jack from Radio Shack. Solder a single wire loop, just big enough to go around the case of the pager, between the center pin and body of the jack.

With the pager on, hopefully receiving a signal, move the loop into various vertical and horizontal positions around the pager for best signal strength. You can use plastic tape to fix the coupler into place once you have found the "sweet spot."

Another alternative would be recommended only if you own the scanner, and only performed by someone familiar with radio. Open the case and find the small rod antenna. Drill a hole in the case as near as possible to the loop antenna, just large enough to mount a mini-jack for connecting an external antenna. Solder to this jack an insulated wire which runs around the loop for one turn, then back to the jack.

This type of close, inductive coupling is more efficient, but physically modifies the

scanner. Additionally, the presence of the new loop may require re-peaking the pager's RF amplifier stage for maximum signal strength. This touch-up should be done with the external antenna connected if the remote location is more important, or with it disconnected if close-in operation is more important.

■ NiCd Questions and Answers

The value of rechargeable nickel-cadmium batteries is legend, but a few facts will help you make the best choices.

Q. When is a NiCd cell or battery pack fully charged?

A. When the terminal voltage rises to 1.35-1.5 volts per cell. During its discharge time, it maintains a relatively constant terminal voltage of about 1.25 per cell. Therefore, a fully charged 12 volt NiCd battery would initially measure 13.5-15 volts, quickly dropping to 12.5 which it maintains during its discharge.

Q. What is meant by "discharging" a NiCd?

A. It doesn't mean dropping the charge to 0; it means reducing the charge per cell from

Bob's Tip of the Month

We have all had the experience of owning a scanner or shortwave radio with smudges ground into the plastic window displays. After an attempt at washing the window, we discover that the smudge is permanently etched into the plastic.

But all is not lost. Non-abrasive metal polishes like Brasso may be used quite effectively in reducing, or even eliminating, lightly-scratched plastic surfaces. Simply buff the plastic with the compound, allow it to dry, and wipe it off with a soft, dry cloth.

If the scratches are deep, or the plastic is

badly warped, discolored, or even broken, it will have to be replaced. But even that chore may not be as daunting as it would first seem, says *MT* reader Ray Miller, N2NJK. But let's let him tell us how he solved the problem on an old scanner he was restoring.

"The plastic display window was one of the worst that I'd ever seen. I didn't know what to try for a good replacement. I looked at craft stores, hobby shops, etc. to try to get an idea and nothing worked. When I was in a WalMart I spotted what turned out to be the perfect fix. They make a clip-on sun shade for the vehicle

Repairing Smudged Plastic Display Windows

sun visor. It is a smoked plexiglass for about four dollars. I brought it home, measured up the correct size, and cut a new display window out using a large X-acto knife. I covered both sides of the plastic with wide clear tape while cutting to avoid any scratches. I then placed it over the original display window. Finally, pleased with the way it would look, I put a dab of Krazy Glue on each corner."

Thanks, Ray, for the excellent suggestion. I'm sure that many of our readers will now be cruising the isles of the local department store looking for similar clear or tinted plastic.

1.25 volts to 1.0 volts; thus, a 12.5 volt NiCd battery, which consists of ten 1.25 volt cells in series, would be fully discharged when its terminal voltage reads 10.0. When you drastically drain the remaining charge on a NiCd, the cells can reverse polarity and dry out the electrolyte irreversibly.

Q. What is the lifetime of a NiCd cell or battery?

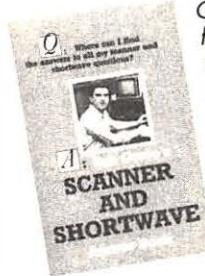
A. On the average, at least 2-3 years, assuming none of the cells goes bad. Some last 5-10 years. You should replace the NiCds when the useful discharge period becomes significantly shorter.

Q. Is there anything wrong with leaving an unused NiCd battery pack permanently on a charger?

A. The proper procedure is to charge a NiCd at 10% its rated capacity; thus, a 450 mAH AA cell should be charged at 45 mA until it tops off its terminal voltage at between 1.35 and 1.5 volts. This shouldn't take more than 12

Questions or tips sent to "Ask Bob," c/o MT are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of MT, or e-mail to bgrove@grove.net. (Please include your name and address.) The current "Ask Bob" is now online at our WWW site: www.grove.net

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hours on a discharged NiCd. It's OK to overcharge for a few hours, but continuous charging will shorten its life.

Q. Are fast chargers safe to use on a NiCd?

A. Yes, just so long as the battery doesn't get hot (warm is OK) or outgas from its vent.

Q. If, after 12-15 hours, the battery does not reach its appropriate terminal voltage, should it be discarded?

A. Not yet. A cell may be short-circuited by metallic crystal "whiskers" (dendrites) which grow from the electrolytic action on the plates. Try "zapping" the NiCd with substantial overcharge current for a few seconds in an attempt to melt the dendrite (do not let the NiCd get hot!). A cell could also be polarity-reversed from low-voltage discharge; try "exercising" the NiCd by several charge/discharge cycles before throwing it away. You should notice a sudden terminal voltage increase when the cell correctly repolarizes.

Q. How long will an unused, fully-charged NiCd retain its charge?

A. All cells and batteries self-discharge with time due to their own internal resistance. A fresh NiCd loses upwards of 10% of its charge per month at room temperature. It's always a good idea to "top off" the charge before using a NiCd that's been in storage.

Q. Does environmental temperature affect storage time?

A. Yes, but not as much as most people think. Never put batteries in a freezer, but a refrigerator may add a few percent to the charge lifetime, both for NiCds and alkalines. Conversely, batteries stored in a hot car will self-discharge more rapidly.

Q. When building a battery pack, is it important to carefully match cells?

A. No. Don't mix sizes in order to avoid deeply discharging of a low-capacity cell which could result in polarity reversal, but don't worry about mixing brands, rated capacities (within a few percentage points), or relative ages. If you want to be on the safe side, charge or discharge the individual cells until they are all at either 1.0 or 13.5 volts before combining them into a pack.

INDEX OF ADVERTISERS

| | |
|---|----------------|
| Alpha Delta | 99 |
| Antique Radio Classified | 71 |
| Arcron Zeit | 65 |
| Atlantic Ham Radio | 67 |
| Communications Electronics | 33 |
| Computer Aided Technologies ... | 90, 91 |
| CSP Technologies | 77 |
| Davis Instruments | 93 |
| Delta Research | 77 |
| Drake, R.L. | 3 |
| DX Computing | 59 |
| Erie Aviation | 85 |
| Fineware | 17 |
| Future Scanning Systems | 7 |
| Glenn Hauser | 39 |
| Grove Enterprises | 13, 29, 45, 97 |
| <i>plus special 16-page Buyer's Guide</i> | |
| ICOM | Cover III |
| Index Publishing | 75 |
| Jacques d'Avignon | 53 |
| Kangaroo Tabor Software | 11 |
| Kevin Carey | 66 |
| KIWA Electronics | 85, 87 |
| Klingenfuss | 93 |
| Lentini Communications | 21 |
| Monitoring Times | 103 |
| Motron Electronics | 79 |
| National Scanning Report | 31 |
| OptoElectronics | Cover II, IV |
| Palomar Engineering | 69 |
| PW Publishing | 67 |
| Radiomap | 95 |
| R.C. Distributing | 81 |
| R.D.I. White Papers | 93 |
| Satellite Times | 103 |
| Scanner Master | 77 |
| SGC Inc. | 25 |
| Signal Intelligence | 67 |
| Skyvision | 81 |
| Universal Radio | 62 |
| Viking International | 7 |
| WiNRADIO | 5 |

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(LETTERS—Continued from Page 4)

references to Part 25 devices, call them *radios* instead of phones! Henceforth there is no such thing as an IMTS phone, cellular phone, cordless phone, or PCS phone. They are not telephones unless they are plugged into the wall.

“Replace ‘phone’ with ‘radio’ at all occurrences. When you write to your congresspeople or to the press, be sure to use the phrase ‘cellular radio’ when discussing these so-called phones.”

Nothing in the word *telephone* should imply wires: tele=operating at a distance; phone=producing sound. But what the hey, if

changing vocabulary changes perception, perhaps we should shake the *cellphone* habit.

In the fantasy world of our cover illustration, Congress thinks if it says it's so, that makes it so. Rep. Tauzin says the Commercial Mobile Radio Service only includes cellular and paging services. That truth is only believed inside the chain link fence, while we in the real world bear the consequences. It's not the ordinary scanner listener that's leaking cellular conversations to the press, cloning cellular devices, or reselling information from paging services. But we law-abiding citizens are the ones who will have to bring the real world home to Congress.

—Rachel Baughn, editor

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By Bob Grove,
Publisher

America's Cacophony to the World

A Guest Editorial by Kim Elliott

■ Conflict of Interest

The Foreign Affairs Reform and Restructuring Act of 1997 is, as I write this, in House/Senate conference. One of its provisions is to integrate the U.S. Information Agency into the State Department. This poses a dilemma for the Voice of America, part of USIA since 1953. VOA's 86 million listeners tune to VOA mainly to get news that is more reliable, objective, and comprehensive than the news from their own government controlled media. Credibility is therefore key to VOA's success. Absorption into the State Department would, at the least, create a perception problem for VOA.

The international broadcasting provisions of the Senate version are likely to prevail. These would separate VOA from USIA and its State Department fate. VOA would report, through its parent International Broadcasting Bureau, to the Broadcasting Board of Governors, which will become a separate agency. The International Broadcasting Act of 1994 created the Broadcasting Board of Governors to serve as a "firewall" between the government and the elements of U.S. international broadcasting. The BBG, in its firewall function, has appointed the director of the IBB. This should have ensured VOA's autonomy.

But the Senate version of the 1997 Act gives VOA its independence and takes it away again. It also stipulates that the Director of the IBB would no longer be appointed by the BBG, but by the President, with the consent of the Senate. Thus, for VOA, the most important part of the BBG firewall will be breached. Furthermore, the Senate wording requires VOA to broadcast daily editorials, exercises in advocacy which set VOA apart from other Western international radio stations.

To help achieve the credibility necessary for success, VOA must have the same autonomy enjoyed by its government-funded cousins, Radio Free Europe, Inc. and Radio Free Asia, Inc. RFE/RL and RFA are also under the BBG, but their presidents are appointed by the BBG, not by the President of the United States.

■ Tortuous Organizational Structure

Autonomy is half the battle for the rationalization of U.S. international broadcasting. Efficiency is the other half. The structure of U.S. international broadcasting would boggle Rube Goldberg's mind. It consists of (1) the Voice of America (worldwide radio and Internet in 52 languages), (2) Worldnet-TV, and (3) the Office of Cuba Broadcasting, which consists of (4) Radio Martí, and (5) TV Martí. The aforementioned are part of an administrative entity known as the (6) International Broadcasting Bureau.

Not part of IBB are the "grantee" corporations (7) Radio Free Europe/Radio Liberty, Inc.—broadcasting in 22 languages of East Europe and the former Soviet Union, of which 17 are also transmitted by VOA and (8) Radio Free Asia, competing with VOA in seven languages. The (9) Broadcasting Board of Governors supervises the whole lot (1 through 8), though with no full time executive.

The Senate version of the Act provides two million dollars for a new (10) Radio Free Iran, which will broadcast news about Iran in Farsi to Iran. VOA presently broadcasts news about Iran in Farsi to Iran. There has also been Congressional discussion of (11) a Radio Free Afghanistan, and (12) Radio Free Africa. VOA already broadcasts to these places, too.

Thus, VOA and the Radio Free Whatevers are duplicating and competing with each other, now in 25 languages, and soon probably in more. This is because of the U.S. "theory" of international broadcasting: the "official" VOA presents world and U.S. news and U.S. policies, the "surrogate" Radio Free X stations provide news about their listeners' own countries.

The theory does not reflect reality: VOA has always broadcast as much news as it could about its target countries, knowing it must do so to attract an audience. Duplication could be eliminated by forcing VOA to adhere to the theory, transmitting only world and U.S. news. Listeners would have to tune to one U.S. station to get part of the news, then retune through the miasma of shortwave to get the rest of the

news. They would probably opt for the BBC World Service, where they can get the convenience of all the news from one station.

In countries where foreign broadcasts are a necessary complement to domestic state controlled media, listeners want the most timely, comprehensive, objective, and relevant news they can get. It must be clearly receivable on their mostly cheap shortwave radios. The United States must concentrate its finite newsgathering, talent, and transmitting resources to provide such a service successfully, wherever it is needed.

■ A Simple Fix

To that end, here's a reorganization plan: Merge RFE/RL Inc. with RFA Inc. Bring VOA and Worldnet into this merged corporation. Rename the new corporation something worthy of a *news* organization (thus shedding the cold war pariah status that has kept Radio Free Asia from getting vital overseas relay transmitters and news bureaus). America's international broadcasting resources would then be concentrated into one globally effective multimedia organization. The BBG would continue as buffer between the government and the corporation.

(U.S. government international broadcasting should not compete with private efforts such as CNN and NBC International. But broadcasts in languages such as Swahili and Burmese will probably never be commercially viable and thus must be government funded.)

Broadcasting bureaucracies are being added while the budget for international broadcasting is shrinking (down 30% since 1994). By the year 2000, U.S. international broadcasting could consist entirely of numerous senior-level managements and front office suites. There might not be any money left for gathering news, making programs, or transmitting signals.

Dr. Kim Andrew Elliott is producer and presenter of *Communications World* on the Voice of America. Views expressed are his own and not those of VOA or the IBB. Kim's articles on U.S. international broadcasting include "Too Many Voices of America" in the journal *Foreign Policy*, Winter 1989/90.



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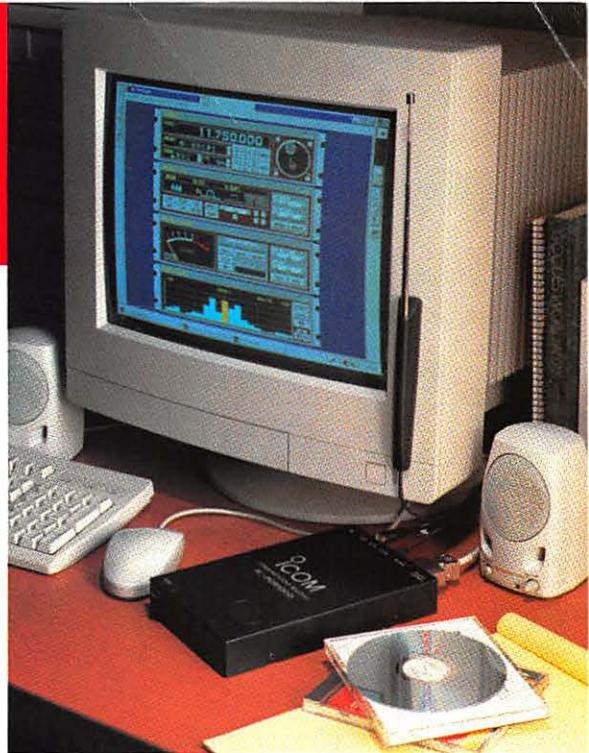
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